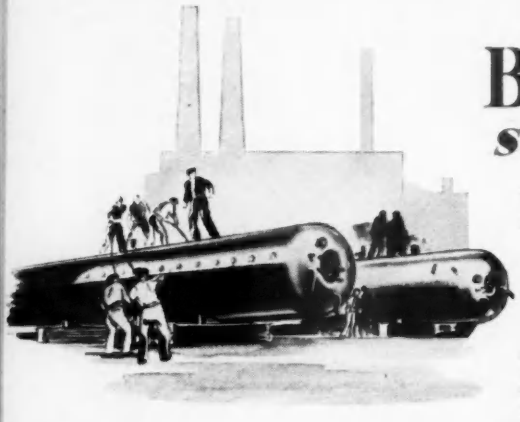
ELECTRICAL TIMES

THURSDAY
12 APRIL
1951
SIXPENCE



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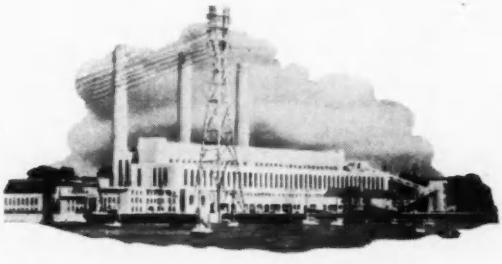

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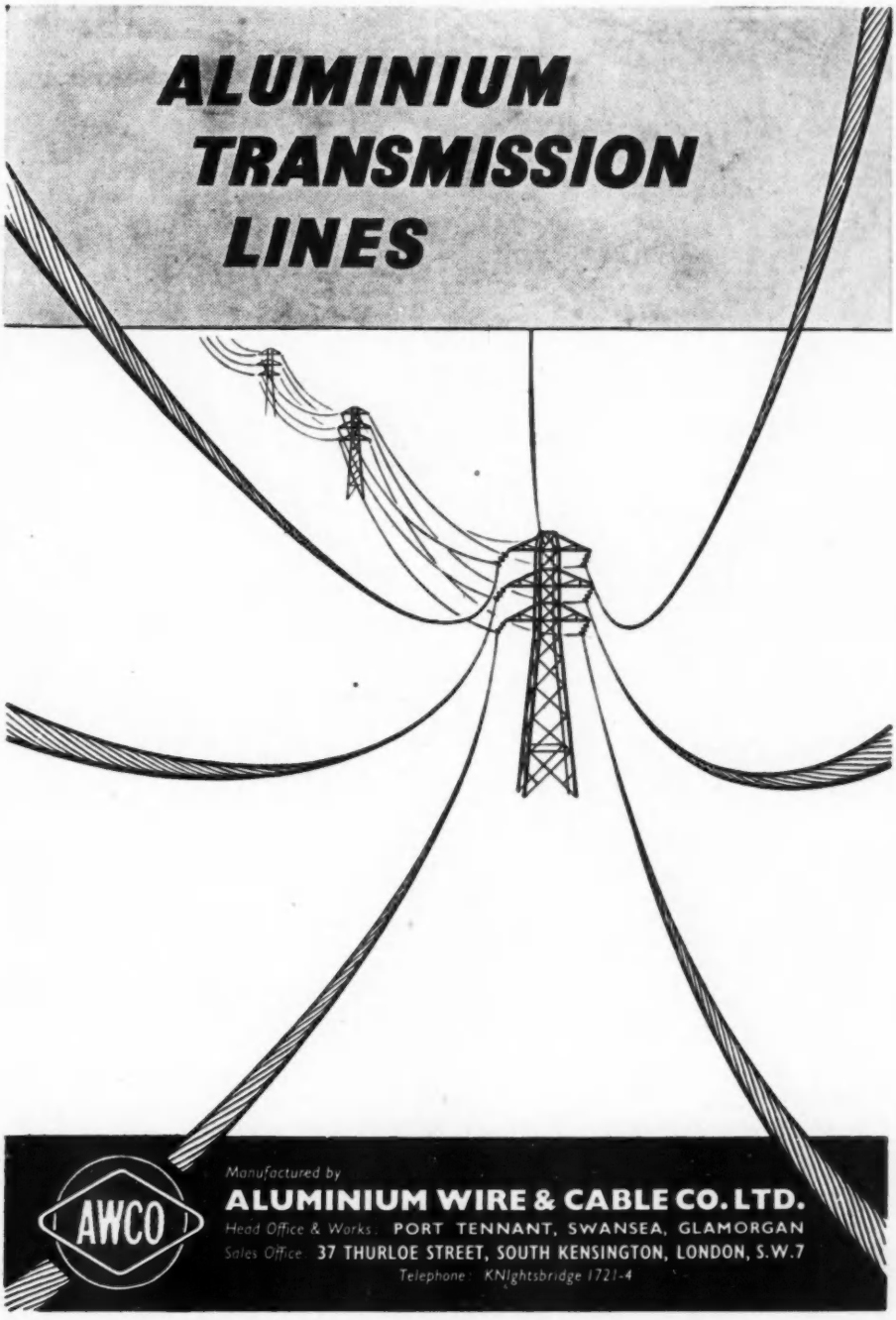

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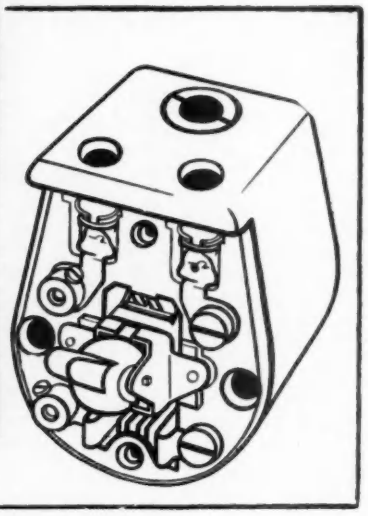

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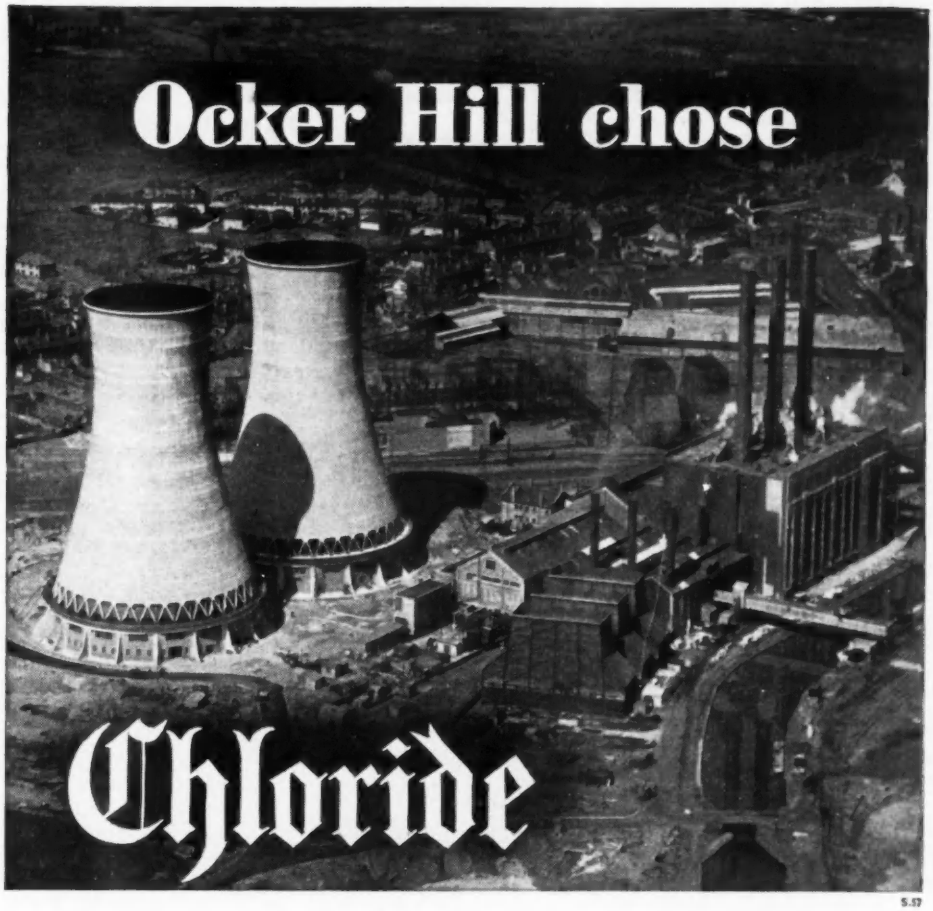

S.57

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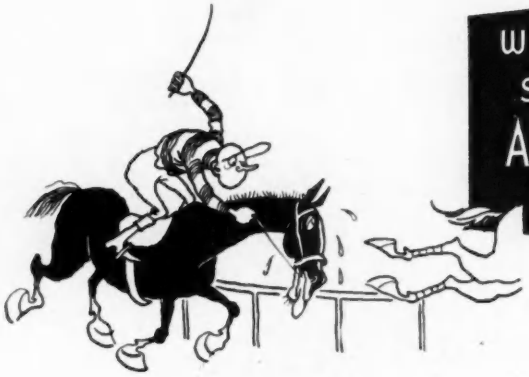

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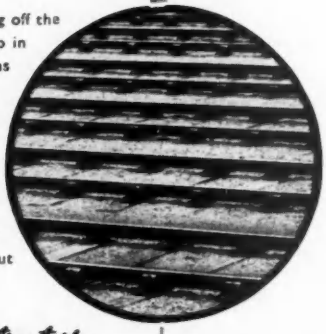

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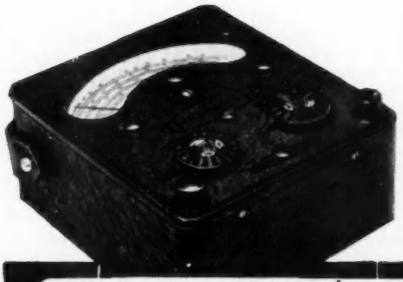

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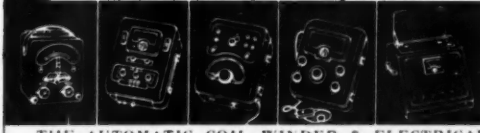

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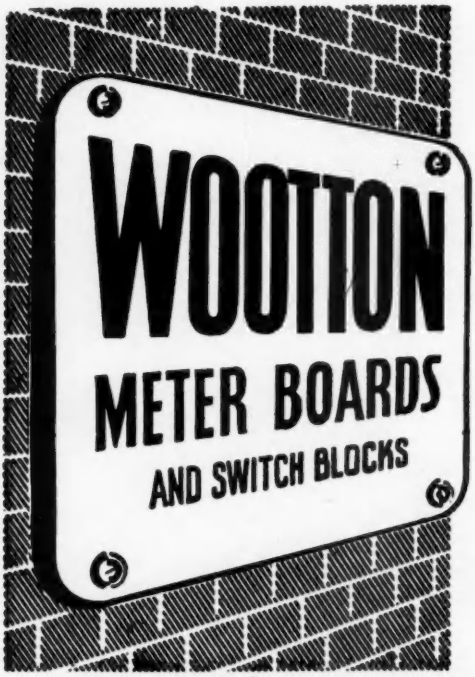

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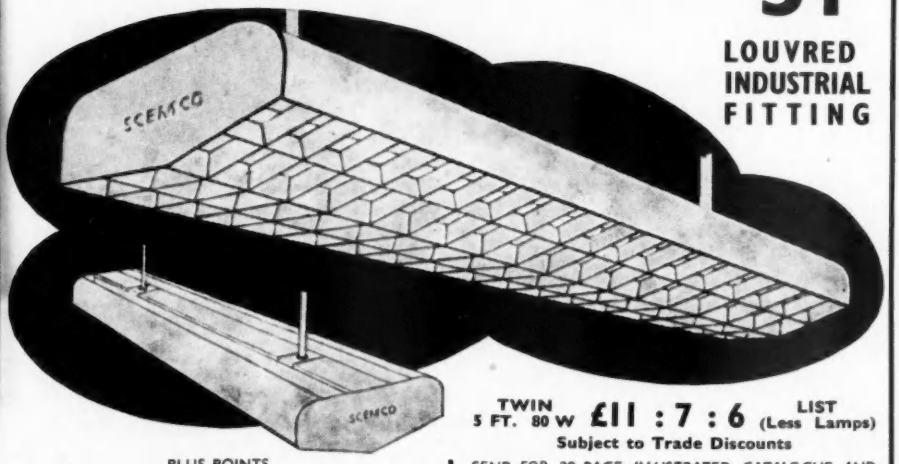

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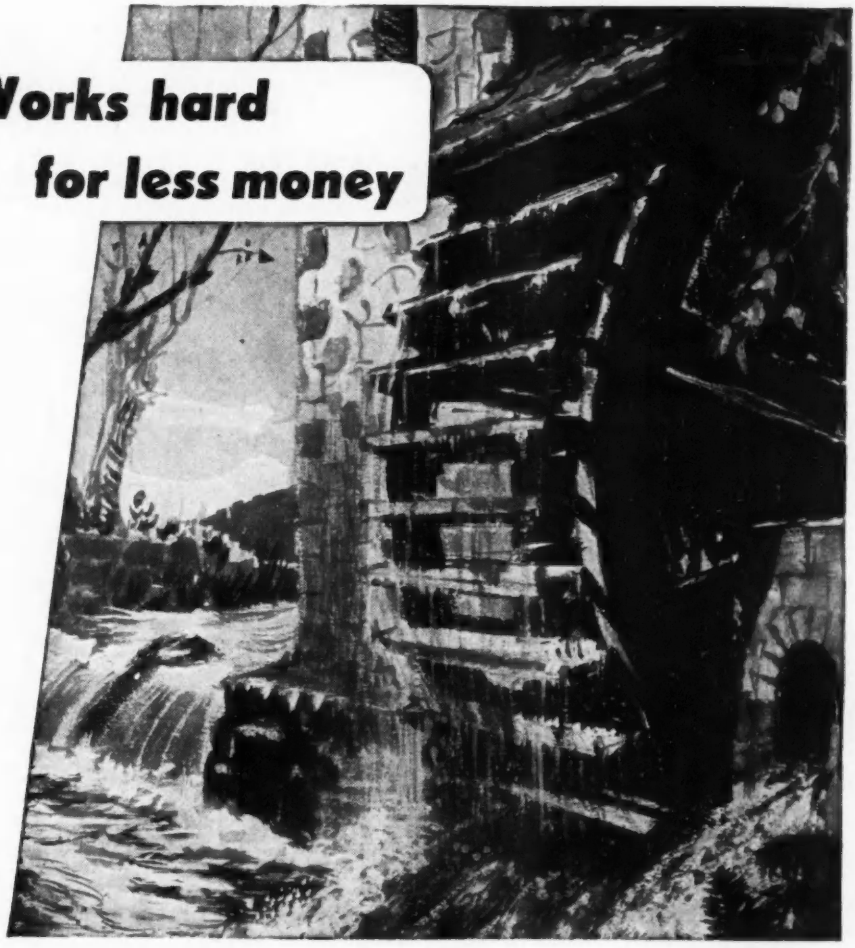

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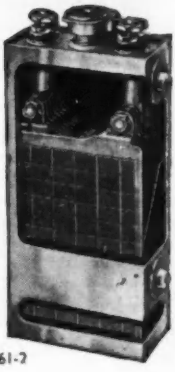

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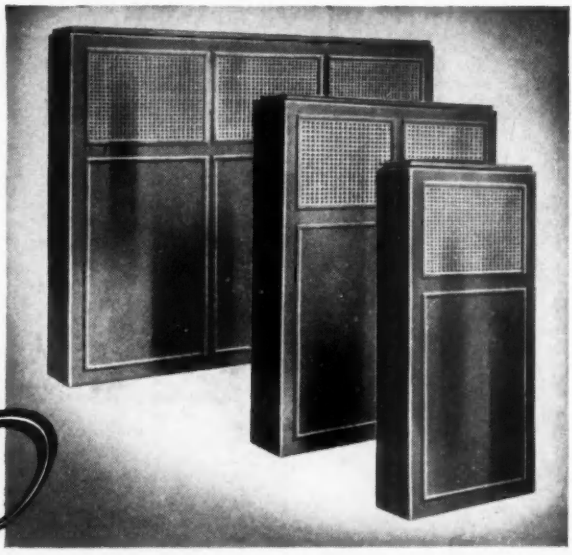

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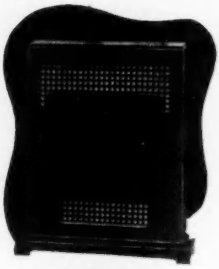

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3,000 v. Pumpless Rectifiers in Traction Service

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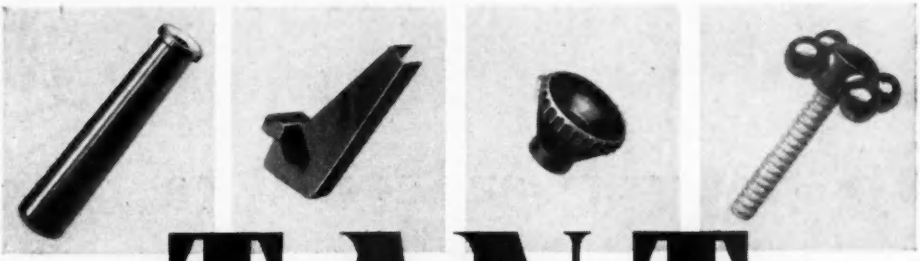

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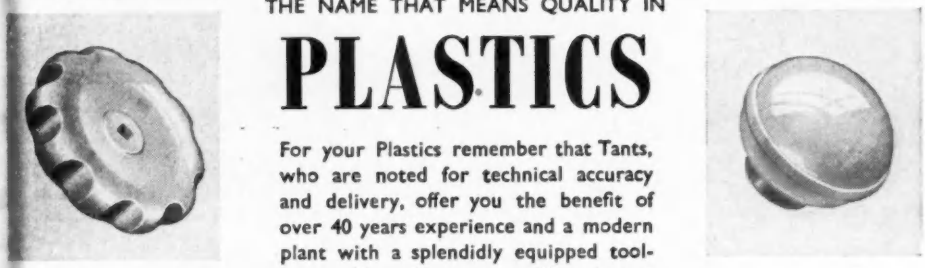

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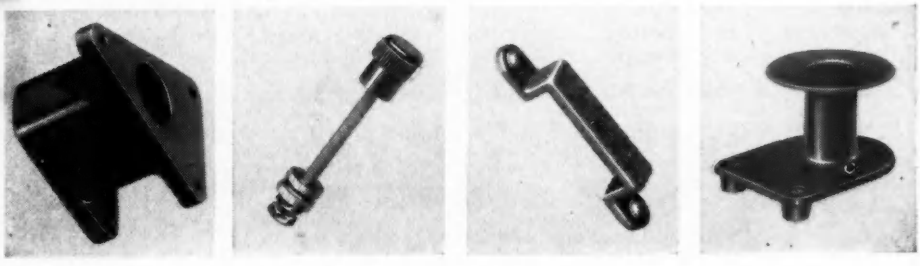

This new price list will save your time

Here, at last, are the *actual* List Prices of Crabtree wiring accessories, ironclad switch and fusegear and motor starters. In Price List 190 we have tabulated, for easy reference, the consolidated price for each product. The prices have been modified to December 28th and include the current increase which, for the past ten years, has been invoiced separately. You will find this new List a great time-saver and if your copy has not yet reached you, will you tell us about the omission—on your business letterpaper — please?

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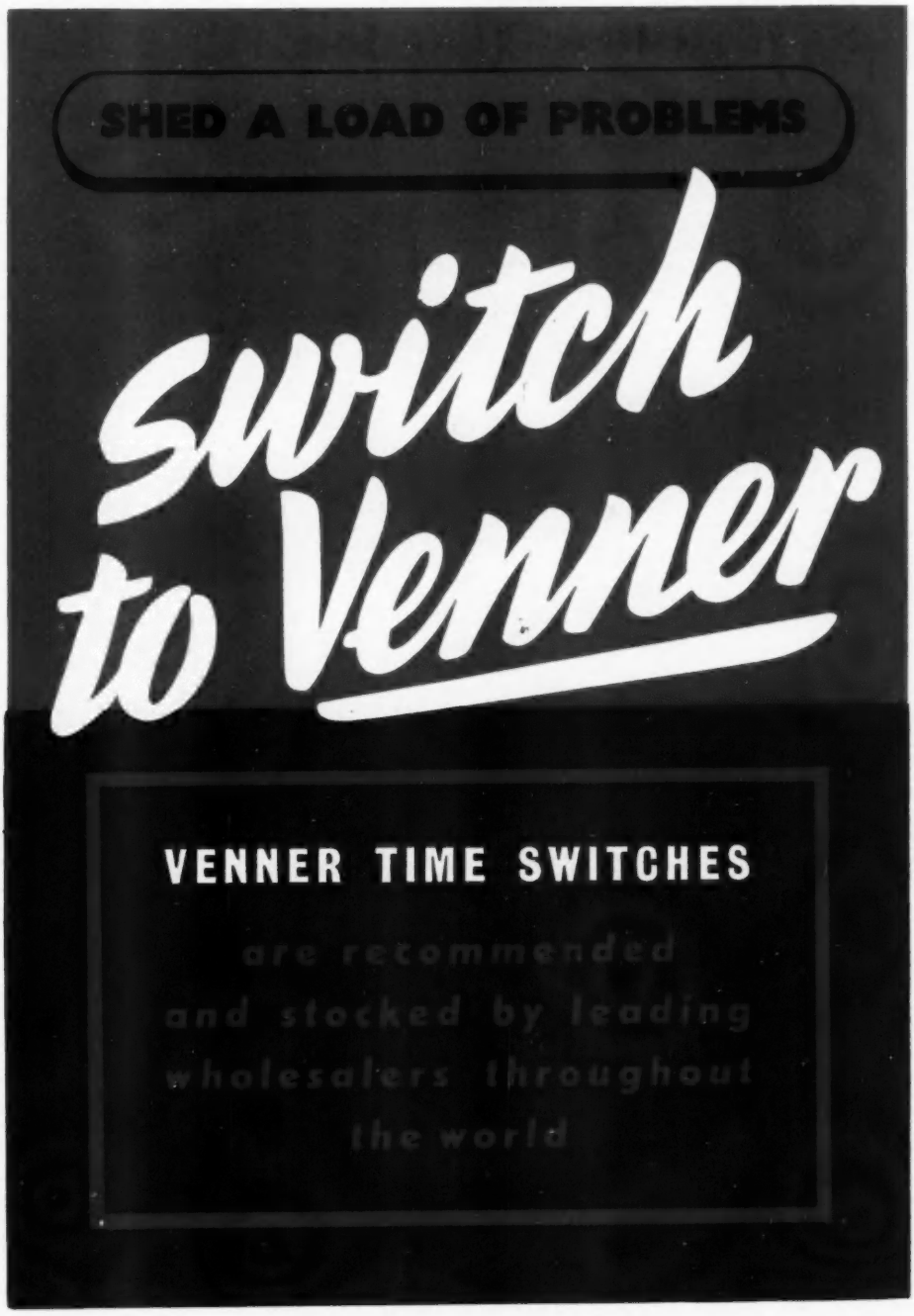
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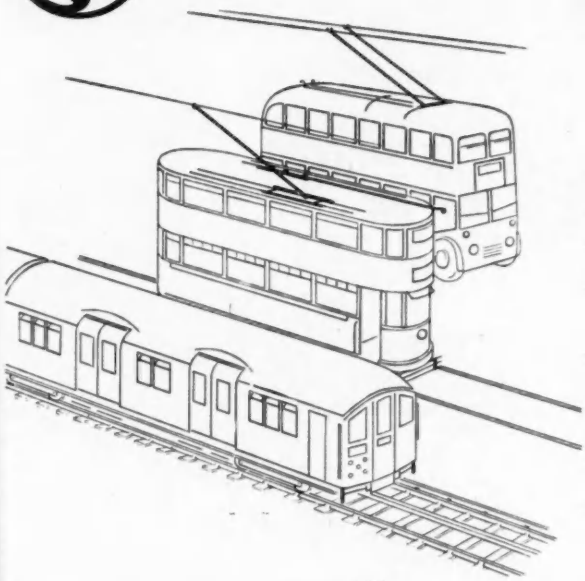

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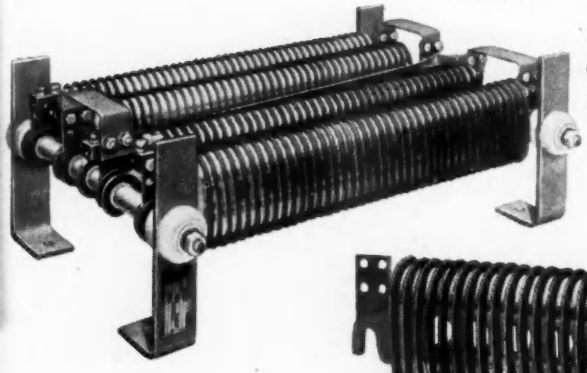

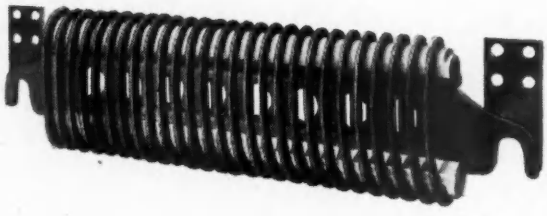

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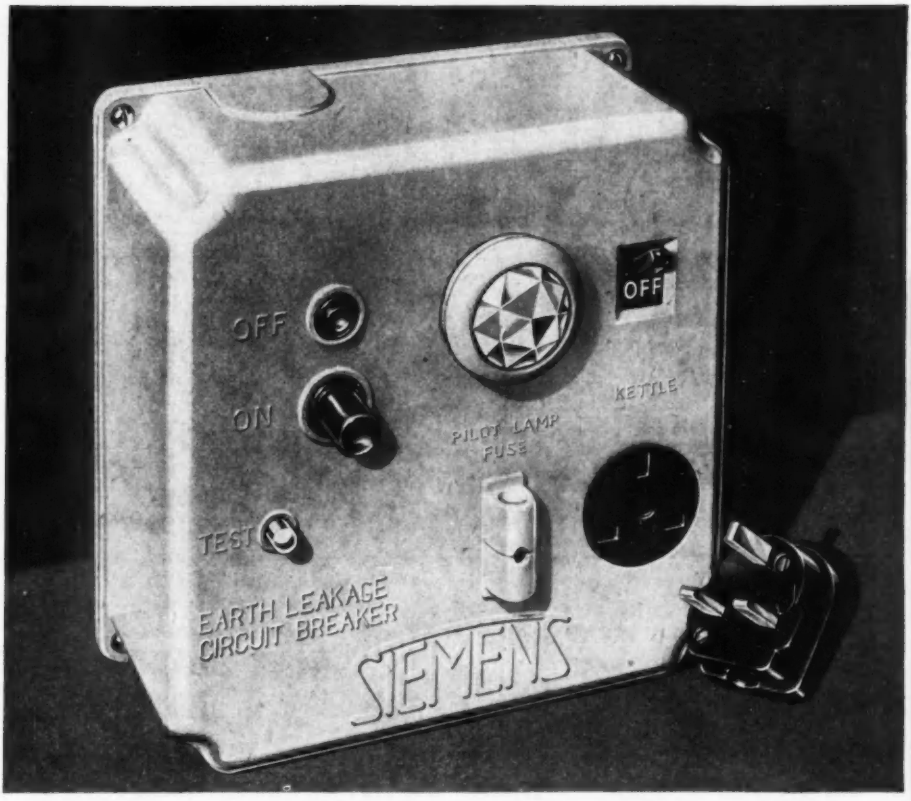

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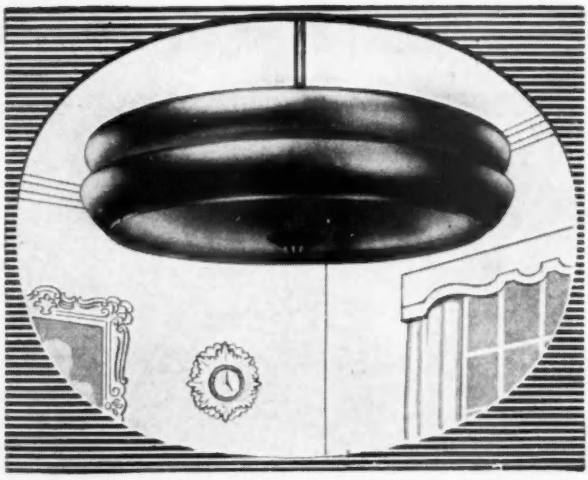

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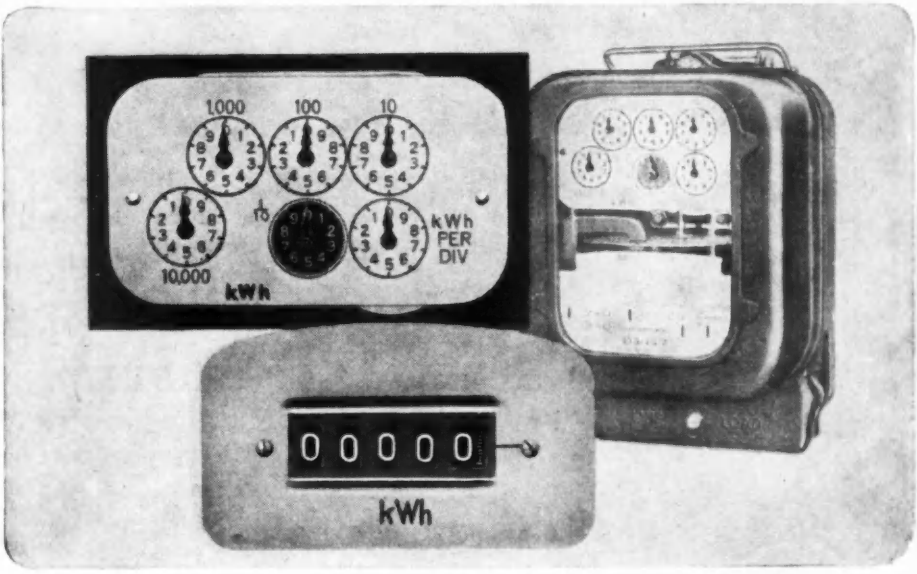

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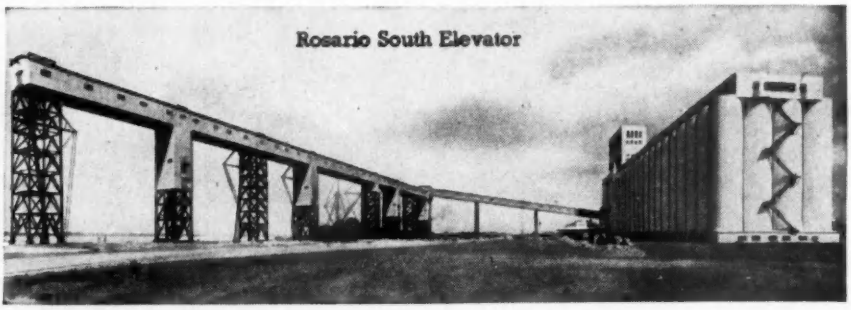
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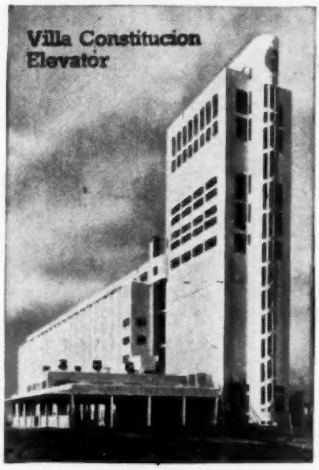
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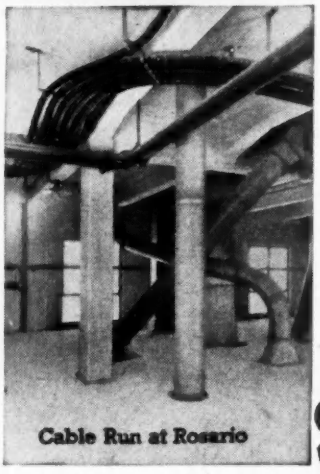
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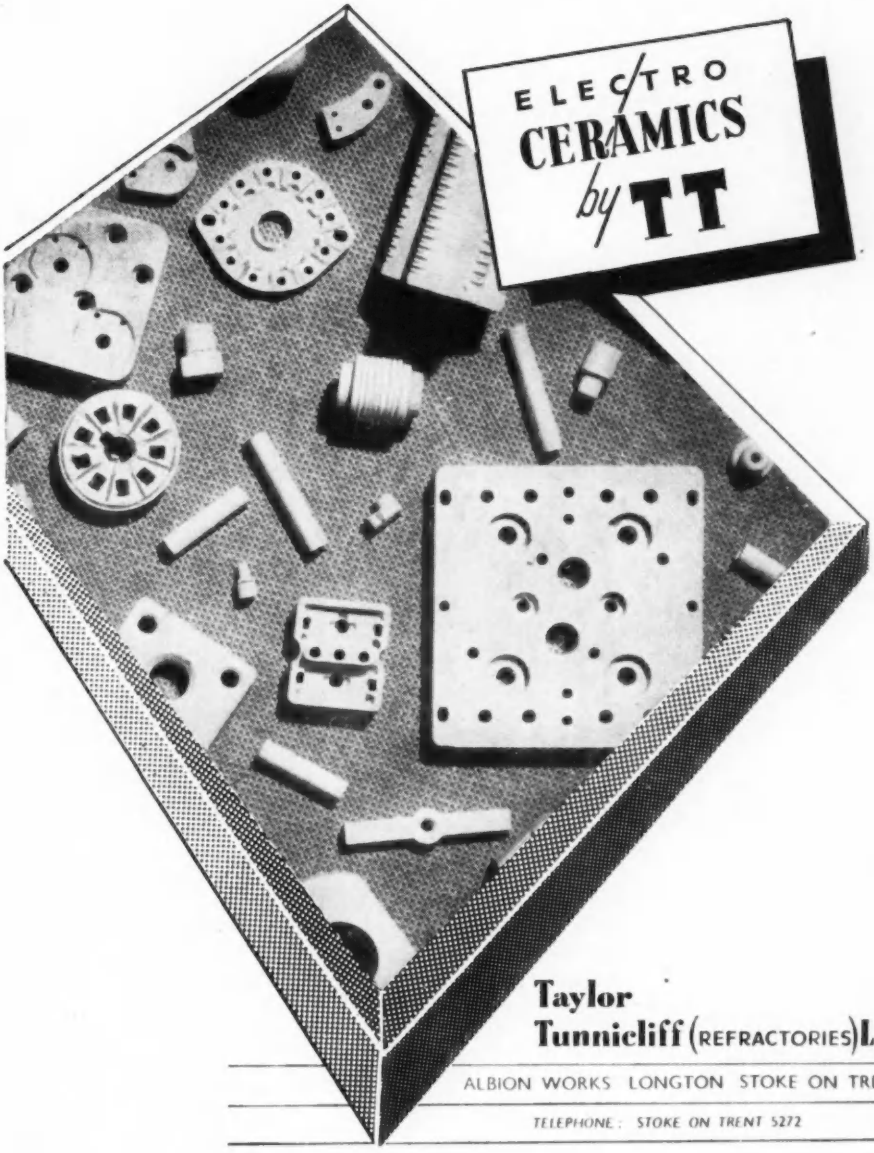

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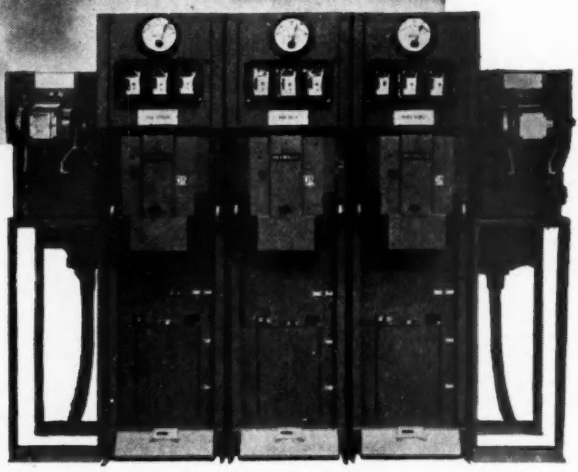

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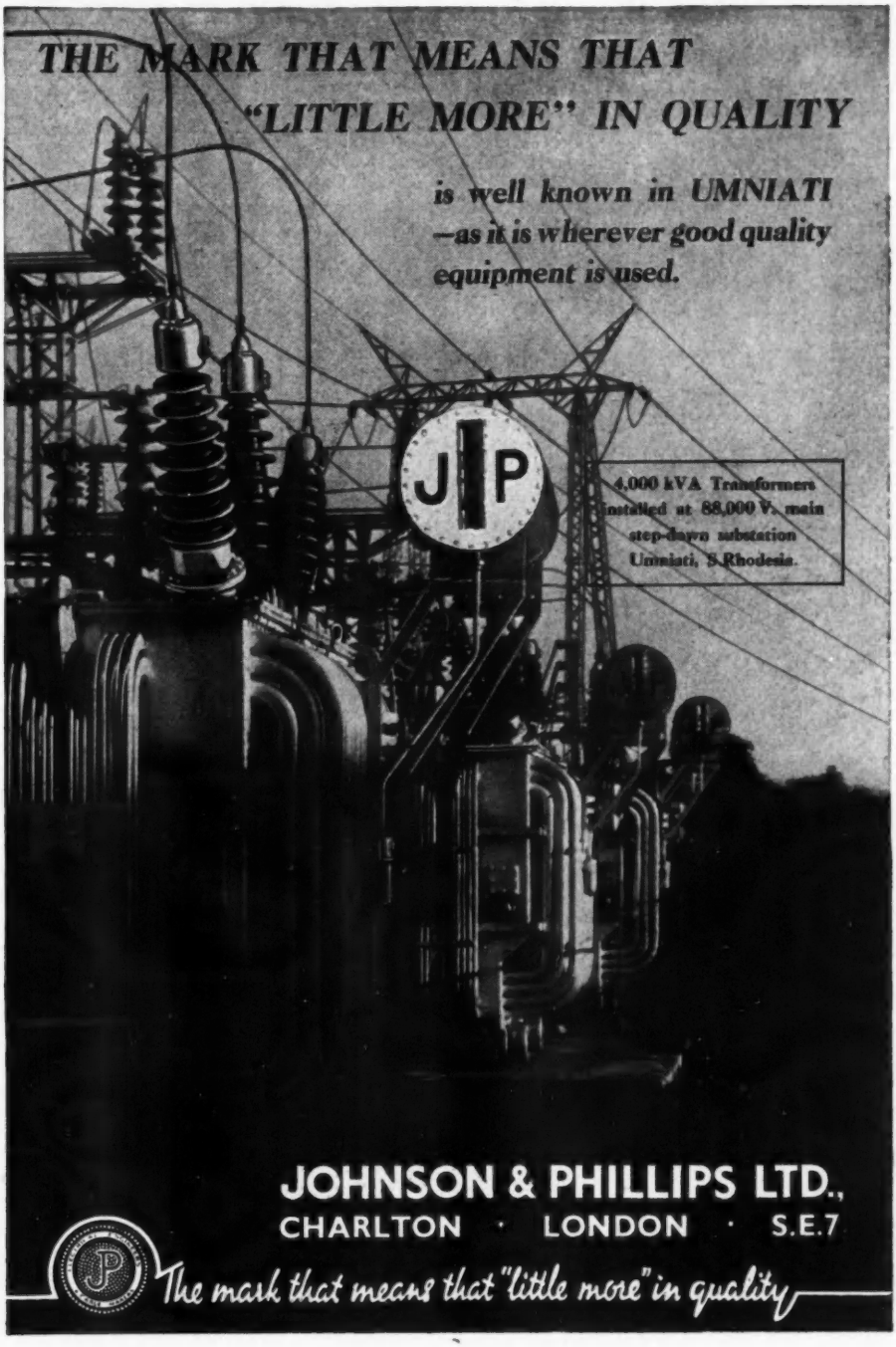
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ELECTRICAL TIMES

Vol. 119 No. 3101 THURSDAY, 12 APRIL, 1951

PUBLISHED EVERY THURSDAY

SIXTIETH YEAR OF PUBLICATION

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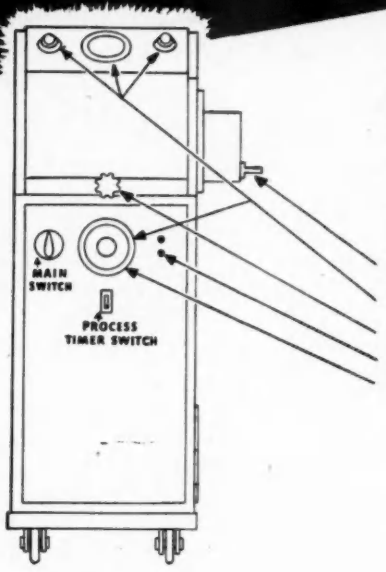

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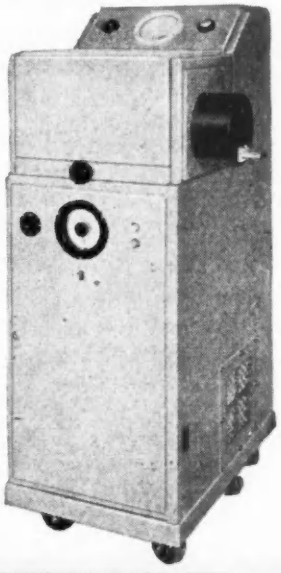

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Editorial

DEFENCE NEEDS KILOWATTS

DEFENCE is the dominant theme of the Government's 1951 Economic Survey. Those detailed calculations of expenditure on the development of electrical generation, transmission and distribution, which in last year's report provoked weighty discussion in the industry are missing from the present uncertain and unhappy document. Fixed investment is covered by a single overall figure showing a small increase on last year: possibly expenditure on the electricity supply industry is to remain similarly fixed at its previous level, about £100 million. If this be so, it fits in badly with the apparent concern for defence and fighting ability. Readiness for defence on the immense scale demanded by modern war implies ability on the part of industry to meet the demands for the weapons of war. This can only mean, more power for industry. In the last war, electricity supply stood the strain imposed by this demand above all, because of one asset it possessed —the reserve capacity provided by the Grid. Operated with heavier loads and closer interconnection than was envisaged by its designers, the country's transmission system added invaluable megawatts to the effective output capacity. This reserve has been fully committed, and there is now no analogous buffer for the increases that would come with a new war. For this reason, strengthening the electricity supply system must become an integral part of defence planning, with an increased rate of expansion of power station and transmission plant. It needs to be as explicitly part of Government policy as tank production.

PRODUCT CONTROLS

SHORTAGES of materials have replaced an unfavourable balance of overseas payments as the principal adverse factor in the economic outlook. This deficiency is particularly worrying since it largely nullifies the effects on output of prospective increases in productivity, one of the most effective weapons in keeping financial conditions under control. The only bright spot in this generally gloomy situation is that private industry is to be urged to extend still further its ingenuity in finding substitute materials and techniques which are not already fully exploited. It is stated that to encourage such work, formal controls of raw materials are to be avoided as far as possible. No doubt, in their own interests, manufacturers will co-operate successfully and loyally. The fact remains that proper balance between this admirable ideal of no formal controls on materials, and the need to allocate some safeguarding priority to essential projects will be hard to fix, and will presumably find expression in the control of the final products. The need for exports will provide a further complicating factor here, and it seems certain that any relative freedom from arbitrary restrictions on the design side will not be matched so far as selling is concerned.

DOMESTIC DRUDGERY

AN evergreen theme expressed where ladies congregate is the task imposed on electricity of removing the drudgery from household duties. It is a faith to which Meteor has been a firm adherent over many years. Unfortunately the achievement of this desirable aim is limited by the very diversity of domestic work, and although vacuum cleaners and washers have established a place for themselves, those major tasks, the preparation of food, and the multifarious cleaning operations are still a long way from a satisfactory solution. Housewives are realists in these matters, and it is of little use producing a device which does in five minutes what normally takes ten, if the device itself requires five minutes to fetch and assemble for use. This factor, the time of bringing into use, becomes increasingly important with the current tend of adding more and more attachments to multi-purpose appliances. The designer there-

fore must not only see that these can be easily and quickly fitted, but should provide for them to be at hand and ready for use and not stored in the kitchen drawer or the depths of a cupboard. The ultimate development may be a special cabinet at which the largest amount of work can be centralised, but even this will still leave much cleaning and food preparation to be done by hand.

UNDERGROUND COMBUSTION

THOSE who expect rapid achievements in the field of underground gasification should study the paper read last week before the Institute of Fuel describing the experimental work in Alabama. The difficulties which arise are inherent in the application of a process requiring close scientific control to conditions where nature can give full vent to her vagaries. The results obtained in this experiment are clearly promising and suggested new lines of approach, one of which is being tried out in this country. The relative ease of complete combustion of the coal underground compared with the closer control required for its gasification, has led to the suggestion of using gas turbines operating on the products of underground combustion. Results from a simple open cycle arrangement are said to be encouraging and indicate that further work should be carried out. It seems unlikely, however, that either of these methods will become the predominant one for thermal generation. Such natural hazards as a blocking of the air flow would inevitably require a considerably higher spare plant factor than with normal equipment. Yet unquestionably with our shrinking colliery manpower, underground consumption of coal could play an important part in co-ordinated thermal power generation.

MIND THE DOORS

LONDON TRANSPORT, we learn, is experimenting with tube trains having the guard's control gear in the centre of the train, instead of the after end. By this means, duplication of controls at each end will, of course, be unnecessary. While they are working on the problem, may *Meteor* put in a plea for additional research on door interlocks? The failure of one door to latch closed results at present in the passengers being turned out and the train completing its journey empty. One possible solution would seem to be to provide each pair of doors with a small external indicating lamp wired across the auxiliary contacts, so that in the event of failure of one pair of contacts the lamp would light up in series with the guard's indicating lamp, thus giving instantaneous location of the defective door. Some device such as a short circuiting switch, combined with a mechanical latch to hold the defective doors closed would enable the train at least to complete its journey in safety, and does not appear over-elaborate, when one considers the rush-hour chaos which can be caused.

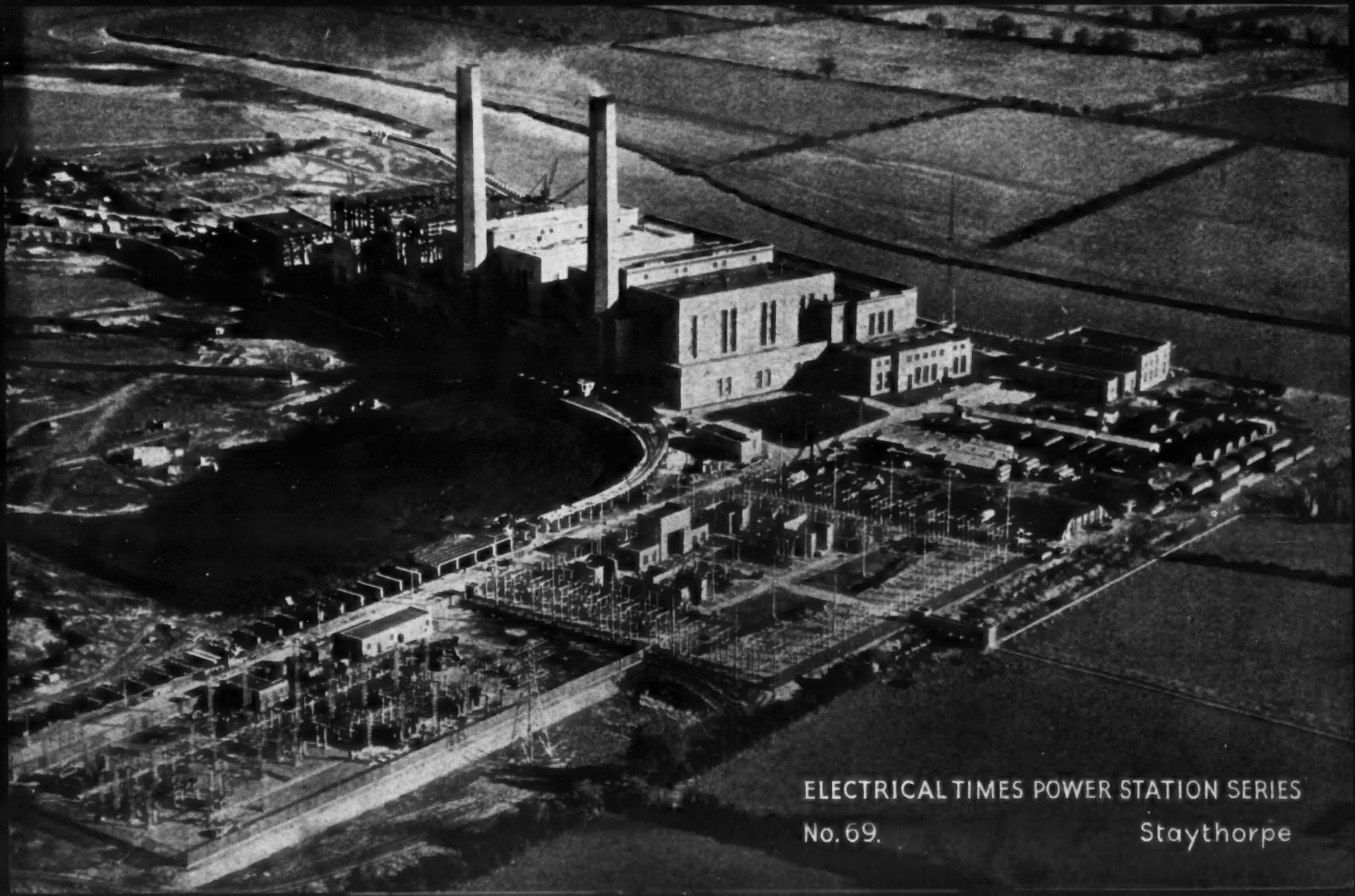
Meteor

THIS WEEK'S PHOTO

STAYTHORPE generating station, operated by the East Midlands Division of the B.E.A., first came into commission just over a year ago, work in the erection of the station having begun in July, 1946. Situated on the west bank of the River Trent, about three miles south of Newark, the station will ultimately house six 60 MW turbo-alternators and 18 boilers each of 240 klb/hr maximum rating, but at present only two sets and five boilers have been installed. The turbo-alternators are in line, the turbine house running parallel to the river, and three boiler houses will be built, the firing aisle being at right angles to the turbine room.

The turbo-alternators are B.T.H. two-cylinder dual-exhaust machines running at 3,000 r.p.m., with direct driven exciters. The Babcock and Wilcox boilers operate at a pressure of 950 lb/sq in. and at a temperature of 925° F, spreader stokers being installed with fully automatic combustion control. There is, indeed, a considerable amount of centralised and automatic control equipment. Apart from the control room for each boiler house, grouped repeater dials, repeating the principal instrument readings from the individual boiler panels, give full information on each boiler and the whole boiler house.

Generation is at 18 kV stepped up to 66 kV by directly connected transformers for Nos. 1 and 2 sets and to 132 kV for the remaining units. In view of the very favourable aspects of the site—exceptional water supplies and cheap coal from nearby coalfields—it has been decided to build, ultimately, two stations, each of 350 MW on the site. Our photograph, by the way, was taken in October, 1950, in fine weather!


ELECTRICAL TIMES POWER STATION SERIES
No. 69.
Staythorpe

The Magnicon

A Rotating Amplifier with Armature Reaction Excitation

Part 1: Principles

By J. GRIFFIN, A.M.I.E.E.

THE Magnicon d.c. generator, in its simplest form, is a "rotating amplifier."* Strictly speaking most conventional d.c. machines are rotating amplifiers, since comparatively low power changes in their excitation circuits can produce large changes in their outputs; of late, however, the expression "rotating amplifier" has become accepted as the generic term for a class of d.c. generator in which the power amplification and the response time are greatly superior to those of the conventional machine.

Possible industrial applications for these machines are almost infinite in their extent, but they are usually employed, in practice, as elements in systems for the automatic control of some output quantity, e.g. the speed of a d.c. motor, the voltage of an alternator, or the power factor of a synchronous motor. Such systems are usually of the "closed loop" type, in which the output quantity is compared with some convenient reference quantity and any small difference between them is used to produce an output from the regulating element of the necessary magnitude and sense to maintain the controlled quantity within certain close limits about the required value.

The regulating element in such a system must usually possess the highest possible power amplification consistent with stability; this is essential in order to maintain within tolerable limits the inherent steady-state "error." In addition, high amplification reduces to an extremely low value the power to be handled by any control circuit; the circuit components can therefore be small and inexpensive, even the most complicated control system requiring only a small expenditure on such items as resistors, rectifiers, and transformers.

A successful rotating amplifier must also possess, as a general rule, the highest possible rate of response to the various signals applied to it as changes in its nett control excitation; this rapid response greatly facilitates the design of a complete regulating system.

Armature Reaction Excitation

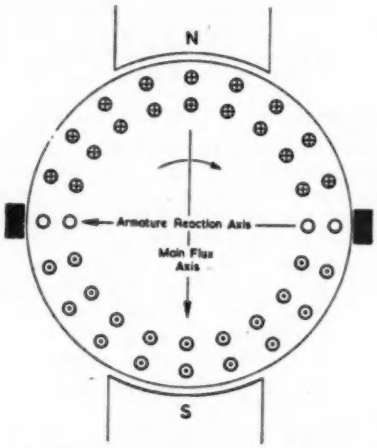
These twin *desiderata* of high amplification and rapidity of response are obtainable particularly readily in special d.c. generators in which the magneto-motive force (m.m.f.) of the armature conductors themselves is employed to establish the main flux in the machine. Such machines, known variously as Amplidynes or Metadynes, have been available for a number of years, though it is only since about 1946 that much published information as to their principles of operation has been available.†

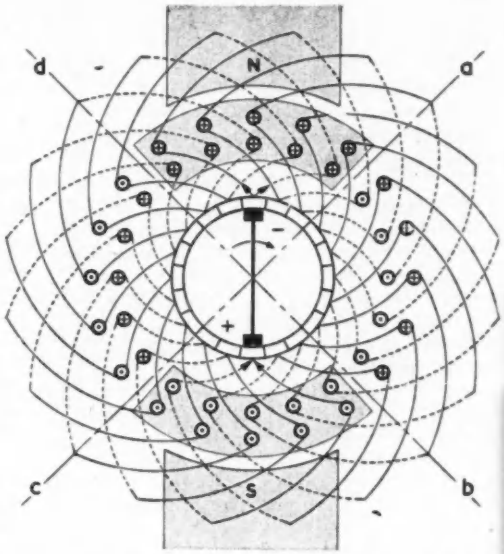
The principle of the Amplidyne is now too widely understood to need any detailed explanation here, but it may be briefly summarised as follows. A small control flux is established along one interpolar axis of a machine with four polar projections but with a normal two-pole armature winding, and the rotation of the armature in this flux produces a small e.m.f. along an axis electrically in quadrature with the control axis. A short-circuit is applied externally to a pair of brushes on this e.m.f. axis, and the resultant armature current distribution produces the usual armature reaction m.m.f. directed along the brush axis. The form of the stator magnetic circuit offers a low reluctance to this m.m.f., and a comparatively large main flux is established. The rotation of the armature in the main flux produces an e.m.f. along an axis electrically in quadrature with the main flux axis, i.e. along the original control axis; this e.m.f. is collected by means of a second pair of brushes on the control axis, and can be used to supply an external load. Compensating coils carrying the load current are provided on the control axis to prevent the armature reaction of the load current affecting the control flux.

Such a machine is clearly a two-stage amplifier; the control flux causes the first stage armature currents to establish the main flux along the short-circuit axis, and the second stage of amplification is provided by the armature rotation in the main flux. A very small control flux suffices to produce the required "magnetising" current in the short-circuited armature, and as this small flux retains effective control over the full machine output it follows that the overall power amplification is very high, a value of 20,000 : 1

* D. R. N. Seed: "Rotating Amplifiers" ELECTRICAL TIMES, 1950, 118, p. 566.

† E. C. Barwick: 'The Amplidyne," ELECTRICAL TIMES 1947, 111 p. 449 and p. 485.





Figs. 1 (above) and 2 (right) afford a comparison between the normal 2-pole and the Magnicon 4-pole armature current distribution

having been quoted as common.* Further, the time constants of the light control winding and the completely distributed armature winding are both very small by comparison with the delay occurring in a conventional generator, and as a result the response of the machine to control field excitation changes is very rapid.

The Magnicon (British Patent No. 566168)

The basic principle of the Magnicon is similar to that of the Amplidyne; a control flux produces, in a short-circuited armature, currents whose m.m.f. magnetises a main field structure, and rotation in the main flux produces the output. In the Magnicon, however, the main and control fluxes are completely independent, and the space wave-form of the armature reaction m.m.f. is trapezoidal (instead of triangular); these important differences are due to the use of a "half-span" armature winding, i.e. to the employment in a two-pole machine of an effectively four-pole armature winding *without equalising connections*.

Fig. 1 illustrates the well-known current distribution in the armature of a two-pole generator with full-pitch coils. The tendency of the armature reaction m.m.f. to establish a flux in quadrature with the main flux can be clearly seen; taken over one pole pitch this armature m.m.f. is of triangular wave-form in space, being zero at the pole centre, rising uniformly to a maximum at the magnetic neutral axis, and falling uniformly to zero at the opposite pole centre.

Magnicon Armature M.M.F.

In Fig. 2 is shown the rather different current distribution in the four-pole lap winding of the Magnicon, the brushes being short-circuited and the armature rotated in a two-pole field similar to that of Fig. 1. To enable the current directions to be traced the actual physical arrangement of the armature end-connections and the positions of the brushes are shown; the inner and outer sets of end connections represent respectively the connections at the "front" (commutator) and "back" ends of the armature, the full and dotted lines indicate respectively the outhang conductors in the upper and lower layers, and the conductors themselves and the commutator are shown in section. An examination of this diagram shows clearly the nature of the Magnicon armature reaction m.m.f.

The armature conductors are divided by the two commutation axes **ac** and **bd**, into four distinct zones, two under the poles and two in the inter-polar spaces. In the slots under the poles the conductors are carrying currents which are in the same direction in the inner and outer layers, whereas in those between the poles the conductors carry currents which are in opposite directions in the two layers. The space wave-form of the armature reaction m.m.f. is thus trapezoidal; over one pole-pitch

* The amplification, being two stage, is dependent upon the square of the machine speed, and the amplifier is in consequence usually driven at as high a speed as is convenient.

the m.m.f. is zero at the pole centre, rises uniformly to a maximum at a point one-quarter of a pole-pitch round the armature, is constant at this maximum for a further half of a pole-pitch (since the opposing currents in the conductors between the poles are magnetically ineffective), and then falls uniformly to zero under the centre of the opposite pole.

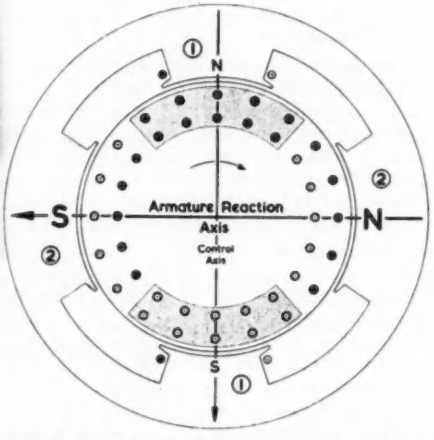
This trapezoidal wave-form has important advantages in a machine of this class over the triangular shape produced by the orthodox full-pitch winding; in particular it is a more efficient producer of a flux (conveniently constant in magnitude) along what becomes the main axis of this machine, and it is more easily compensated by comparatively concentrated coils on the control axis. These desirable features are, of course, obtained only at the expense of the output; the output reduction inevitable (for given magnetic and electric loadings) in any class of electrical machine with other than full-pitch windings has to be accepted.

The complete magnetic circuit of the simple Magnicon generator, with the first stage or "magnetising" currents set up by the control poles (1) and the short-circuited brushes, is shown in Fig. 3; it is clear that the low reluctance path provided by the main poles (2) will enable the armature reaction m.m.f. to establish a main flux along the horizontal axis as shown. The rotation of the armature in this main flux will produce an e.m.f. across a pair of brushes placed (physically) on the main axis, just as rotation in the control flux produced a small e.m.f. across the brushes on the control axis, and if these two brushes on the main axis are connected to some external load resistance a power output can be obtained from the machine.

Compensation

The load current distribution in the armature is similar to that of Fig. 2, but shifted, of course, through a right angle in the direction of rotation. The "second-stage" armature reaction m.m.f. can be seen from Fig. 4 to tend to establish along the control axis a flux in opposition to the control flux, and since this armature reaction m.m.f. would completely overpower the relatively small control m.m.f. it is essential for it to be neutralised. This is achieved by fitting, in slots in the main pole faces, a compensating winding carrying the load current. In practice it is often convenient for this compensation to be inexact; under- or over-compensation gives to the output some degree of compounding—in particular slight over-compensation gives the machine a rising voltage/excitation characteristic on load, and in some applications (notably the alternator voltage control mentioned later) this is a desirable feature, provided that stability is maintained by some form of "negative feedback."

The actual current distribution in the armature on load is a combination of the first and second stage currents; the current in any one conductor is the arithmetical sum or difference of the magnetising (first stage) current and the load (second stage) current. Fig. 5 shows the complete current distribution based on a



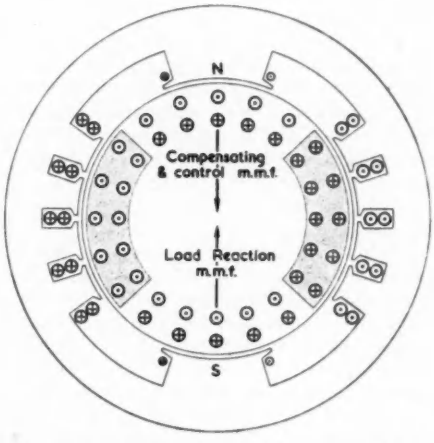


Fig. 3 (left) shows stage one: main pole magnetisation (1) control poles, (2) main poles, and Fig. 4 (right) indicates the load and compensating current distribution in the second stage

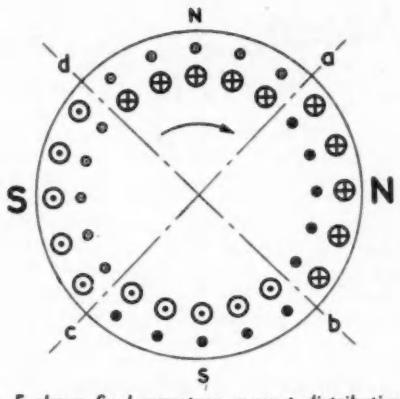


Fig. 5 shows final armature current distribution

typical practical case in which the load current is three times the magnetising current; it can be seen that the resulting copper loss is completely uniform round the armature periphery, since in any one slot one of the conductors is carrying the larger, and the other the smaller, of the two resultant currents.

Commutation

As in the Amplidyne the commutation problems at the two brush sets can be considered independently, though their discussion is complicated somewhat by the effect of the four-pole armature winding.

Considering first the magnetising or short-circuit current it will be clear from Fig. 2 that there are two commutation axes, **ac** and **bd**, mutually perpendicular and situated symmetrically exactly between the main and control axes. On one axis, **ac**, commutation occurs only in the conductors in the lower layer, the currents in the upper layer remaining unchanged; on the other axis, **bd**, the currents in the lower layer are unchanged, commutation occurring only in the conductors in the upper layer. Reference now to Fig. 4 will show that with the load current distribution the exact converse is the case; commutation still occurs only on the axes **ab** and **bc**, but in each case the conductor whose first-stage current remains unaltered in Figs. 2 and 3 is undergoing reversal of the load current. This is, of course, only to be expected, since the load current distribution is that of the first stage shifted through a right angle.

The commutation at any one pair of brushes is thus quite unaffected by the existence of the other pair, since in any coil undergoing commutation at one brush set the current component handled by the other brush set remains unaltered. An examination of the current changes occurring as conductors cross the two commutation axes in Fig. 5 will confirm this conclusion.

All the coils undergoing commutation at any particular instant are situated in the inter-polar spaces, and in consequence have no dynamic (i.e. rotational) e.m.f. induced in them; commutation is thus no more difficult than in a conventional generator. For the relatively small output normally required from machines of this type (which are almost invariably employed in practice to provide the excitation for the field of some much larger machine) it is seldom necessary to fit inter-poles, any necessary commutation voltage being provided by the contact resistance of the brush. For larger machines, however, inter-poles can be provided, and such inter-poles would carry windings excited by both the magnetising and load currents.

Drying Out Transformers

AN unusual method of drying out the insulation of transformers whilst they are in service is described in the February 12 issue of *The Electrical World*. The method consists of circulating nitrogen through the air space above the oil in the transformer tank, and then removing by silica gel and carbon, the water and oil vapour from the gas, before reintroducing it into the tank.

Initially this system was devised to avoid the taking out of commission of a single phase unit in a three-phase bank. The unit was a 20 MVA, 66/13 kV water-cooled transformer and a leak occurred on a cooling coil. This drying method, in one month's operation, removed 100 oz. of water and reduced the insulation power factor test values by 24% for the high voltage winding to earth and for the low voltage winding to earth, and by 16·5% between windings. In seven months the transformer insulation power factors were back to normal and 900 oz. of water extracted. Thus approximately 6¾ gals. of water were removed without loss of service.

The method can be applied easily to any transformer which can be sealed to hold a pressure of a few inches of mercury above or below atmospheric pressure, and which has—or can be made to have—a gas space or blanket above the oil at least 3 in. deep.

A mercury regulator may be used to act as a safety valve in case of any trouble in the circulating system, and the U tube is set to relieve pressure over ¾ lb/sq in. or a vacuum over 1 in. of mercury.

Power from the Atom

Mechanical and Economic Problems Involved

THAT atomic energy for power purposes was an economic proposition was emphasised by Mr. R. V. Moore in his lecture given to the Electrical Power Engineers' Association last Monday. He thought that the economic and effective exploitation of nuclear power in its present early stage of development was fraught with many problems and difficulties. Since fission energy appeared instantaneously in the form of heat in the uranium rods constituting the pile there existed a basic thermodynamic problem of removing the heat from them and making it do useful work. It was certain that the early plants will employ a conventional steam cycle for this purpose since the basic scheme would be uranium fuel elements located accurately in a graphite block with a heat transfer fluid circulated between reactor and the boiler by pumping plant.

There were certain difficulties, however, associated with building such a plant. Within the reactor only materials which did not absorb neutrons could be used in any quantity.

To date, aluminium had been used extensively in the experimental and production reactors. Its low melting point, however, practically eliminated its use in power producing reactors. New alternative materials have had to be found.

The tremendous concentration of energy in uranium was at once its supreme virtue and a difficult challenge. It meant that it must be worked at a high rate and preferably for a long time, during which major physical changes took place in the fuel elements. Each of those elements formed during fission had different neutron absorbing properties, the more abundant neutron absorbers affected the behaviour of the reactor profoundly.

To contain the radioactive products of fission and to separate the uranium from the coolant to prevent chemical action taking place, the uranium fuel elements had to be covered in a suitable material, thus two heat transfer films were introduced—uranium and covering, covering and coolant—this fact had a profound effect on the mechanism of heat transfer.

Fuel Supply

Uranium was not a scarce element, it was 20 times more abundant than silver and one-twelfth as abundant as lead.

In addition to naturally occurring fissile material, there were two known artificial fuels —plutonium and uranium 233. The possibility of converting the abundant isotope of natural uranium and the metal thorium to a fissile material was potentially of vital importance in any large scale power scheme, especially as it was theoretically possible for the yield of new fuel to exceed the consumption of the old—a process known as breeding.

Economics of Atomic Power

An atomic power station would be similar to a coal fired station in all parts from turbine steam pipe onto the consumer. The investment and operating cost of this part of a system represented something like 50% of the cost per unit. The introduction of atomic power generation could affect therefore only half the cost per unit.

The nuclear reactor together with its heat exchanger in an atomic power station would replace the boiler installation in an ordinary steam station and it is probable that the capital cost of the nuclear plant would be higher than that of the boiler.

The energy/weight ratios of coal and uranium were as below

TABLE I

	kWh/Kg.	
Coal	9	Chemical action
Uranium ...	23×10^6	Nuclear reaction
Mass-energy conversion ...	25×10^9	Einstein $E = mass \times c^2$

Then if B_c = cost of coal per Kg
B_a = cost of uranium per Kg
u = kWh sent out per annum
η = overall efficiency of both steam and atomic power station.

Then for the fuel costs of the two plants to be equal

$$\frac{B_c u}{9\eta} = \frac{B_a u}{23 \times 10^4 \eta}$$

$$B_a = 23{,}000\ B_c$$

If B_c = 50s. a ton then B_a = £58,000 per ton.

Since the pre-war cost of uranium ore was about £2,000 a ton, the margin seemed reasonable to allow for refining, preparation of the fuel elements, etc. It could be concluded that the economic possibilities of nuclear fuel in relation to other methods of generation looked quite bright.

Our readers' views ...

Voltage Variation in Canada

AT a recent meeting of the Executive Committee of this Association our attention was drawn to an article which appeared in your publication *Electrical Times* of December 28, 1950, page 1031, in which it was stated that the problem of voltage fluctuation was causing difficulties in parts of Canada and that a study recently made showed few places free from the trouble, while voltage variations of 30% were not uncommon. This statement was evidently made by Mr. J. C. Sola, President of the Sola Electric Co. of Chicago.

It is felt that this statement is a gross misstatement of the facts and reflects on the utility industry in this country. A survey presently under way by our Association, shows that no fluctuation of this nature exists on any utility system in Canada. There may naturally be some voltage fluctuation at the far end of long rural extensions, but it is doubted that it ever reaches the figure quoted by Mr. Sola and we would state that if fluctuations, as mentioned by him, do occur, they are definitely uncommon.

B. C. Fairchild
Managing Director
CANADIAN ELECTRICAL ASSOCIATION
MONTREAL

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Engineers Wanted

IF the position of the graduate engineer with the Electricity Authority leaves much to be desired, as it does as "W. A. J.", Hampshire, states in your issue of March 22, then that of the electrical technician is even worse.

I am one of these "Cinderella Specialists." Fairly capable, if I may believe a recent testimonial, and my technical knowledge entitles me to be classed as an "authorised person," so my duties can range from "switching" to big power-meter installations taking in protection relay fixing, oil filtering, etc., on route. (I have even been put on painting when work was slack.)

My years of intensive study now bring me one penny an hour extra but my post being a provincial one my pay, 3s. 1½d., is roughly 2d. more than that of a fitter's mate in the London area, and 3d. less than a contractor's wireman.

The days are gone, I know, when a jointer might rise to manager, or engineers made by length of service, but ability should still count and merit bring its reward both for engineer or technician if the industry is to attract the best.

I am getting on now and look like "staying put," but I notice there is no rush of candidates anxious—or indeed able—to inherit my plated screwdriver.

SUSSEX *"Amps"*

◆ ◆ ◆

Earthing Methods

MR. MARSHALL, in his article on efficient earthing in your last issue, seems to have ignored the small diameter copper rod electrode. This is usually the simplest to install and can be driven quickly to considerable depths by a power-operated hammer. The penetration achieved into the subsoil, frequently of much lower resistivity than the top soil, gives a low resistance figure for the amount of material used; and, theoretically the long vertical electrode is the most effective.

The pipe of over an inch in diameter and the plate, are surely on the decline. It is my own experience that in low resistivity soils the driven rod of small diameter is the most efficient electrode and in high resistivity soils, buried copper tape.

Mr. Marshall is also remarkably conservative in the quoted range of resistivities. In this part of the world and in most areas of Scotland where hydro-electric schemes are in progress, the values of soil resistivity measured are from 100,000 to 1,000,000 ohms/cu. cm. That of river water is usually over 30,000 ohms/cu. cm. (That of Loch Lomond about 13,000 ohms/cu. cm. when measured by the writer.)

Under these conditions all earthing has to be looked at from a different point of view and the resistance of the measuring electrodes being so high, even the instruments normally used are prone to large errors difficult to assess.

H. R. Mathias
INVERNESS

Chester Tidal Plant

ALL hydro-electric engineers will deplore the recent closing down of Chester's 650 kW tidal power station. This unique installation owed its origin to the genius and enthusiasm of the late S. E. Britton, for many years the city's electrical engineer. The plant must have saved many hundreds of thousands of tons of coal and demonstrated the efficiency and reliability of hydro-electric equipment. Many people did not even know that a tidal power plant existed in this country.

W. E. Warrilow
BOURNEMOUTH M.I.E.E.

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Commutator Maintenance

I READ the article "Commutator Maintenance" by F. R. Stanley, in your issue of December 14, 1950, pages 937-940, with great interest. I am in full agreement with the author's statement that turning, in particular diamond turning, is an excellent practice, even a necessity on new commutators, but I fully disagree with his statement why this practice should not be correct for used commutators. There is, at first, with small commutators the possibility of turning these on the same machine on which the original commutator has been turned and in this instance the author will probably agree that there would be no difference. Very large commutators can actually be turned in their own bearing *in situ* by using special fixtures which in general are not too expensive considering the value of the total machine. As a matter of fact similar fixtures as shown in the article can be used for turning, in particular diamond turning. The difficulty with large commutators lies only in the fact that during turning they cannot run under their own power and a special drive, if possible a low speed drive, has to be provided. In this instance, the metal cutting tool need not be insulated.

Since the maintenance of the commutator is an important problem it should be possible to have commutators tested which are treated by methods suggested by F. R. Stanley and which are diamond turned according to the usual practice. Already surface finish records may supply a partial answer.

P. Grodzinski
LONDON A.M.I.Mech.E.

An Uncertain Survey

LITTLE in the way of concrete prediction is to be found in the Chancellor of the Exchequer's "Economic Survey for 1951," published last week. Uncertainty prevails throughout the document, with the rearmament programme and the shortage of materials appearing throughout the 46 pages as factors bedevilling any attempt at detailed planning.

Overall, the survey states that the Government does not consider that the country's problems can be overcome by giving an over-riding priority to arms production, but wherever necessary, formal controls and powers of direction over production will be used. Exports of coal, metals, and some metal goods will drop because of the demands of rearmament. To prevent excessive deficits in the United Kingdom external accounts, an increased export effort by industries producing consumption goods is called for.

The industrial population is expected to be little changed by the end of 1951. Coal output during the year is estimated as 208-210 million tons deep mined and 11-12 million tons open cast. No chance is seen of avoiding electricity load shedding. The forecast for steel is more gloomy still, with a slight decrease in production accounted for by lower availability of scrap. More serious are the much publicised shortages of sulphur (and sulphuric acid), of zinc and of copper. A warning is given that such shortages of raw materials are likely to be long-term in character. To combat them, it is vital that new sources of supply should be developed quickly.

Improved productivity, which has helped notably in increasing production over the last few years, has to be considered against this background of materials shortages. For the purposes of the survey, a 4% increase in average production for 1951 on that for 1950 is assumed, and the attainment of this restricted improvement is dependent on increased imports of several basic materials.

Turning to financial matters, the survey predicts at £350 million the increase in resources available for use at home, in terms of 1950 prices, and contrasts this with an increase of £400 million in the total required for expenditure by public authorities. This estimate, which allows nothing for increased home investment, suggests a fall of £50 million in the value of goods, etc., available for personal consumption. Any reduction in productivity will worsen this position, with gravity varying according to the nature of the shortfall.

National expenditure for 1951 is put as £14,500 million, compared with £13,572 in 1950. Corresponding amounts for fixed investment at home are £2,230 million and £2,162 million.

2,000 A WEEK

Output of G.E.C.'s Swinton Cooker Factory is limited by raw material situation

ALTHOUGH the present raw material situation imposes heavy restrictions, the cooker factory of the General Electric Co., Ltd., at Swinton, near Mexborough, Yorkshire, which we last week had the privilege of inspecting, is stated to be equipped to produce upwards of two thousand cookers a week.

Insufficient labour in Birmingham to meet post-war production needs was the primary reason for the decision to remove from that area. At Swinton, labour, although untrained, was plentiful, and a factory of adequate size—although poor condition—was available.

Looking at the factory today, it is difficult to realise that it was formerly a derelict munitions factory and that its conversion involved, amongst other things, the removal of more than 3,000 lorry loads of rubbish, the re-laying of two miles of railway lines and the re-roofing of much of the main factory block, not to mention additional buildings and foundations for heavy plant. The fact that a cooker was assembled and dispatched within three months from the acquisition of the factory says much for the way in which the job was tackled. The factory is now one of the largest units in the British Empire devoted exclusively to cooker manufacture, having a roofed area of some 400,000 sq ft in a site of 24 acres. The labour force is about 1,200.

Heating Elements

The D.C.113, G.E.C.'s post-war design, was the first British cooker to utilise tubular sheathed elements in the oven, and the manufacture of these elements was found of particular interest, since the quality of the elements is the measure of reliability of a cooker. The process, evolved in the company's research laboratories, utilises a sheath of double construction. The inner sheath consists of an open-seam tube with a gap wide enough to allow the element to be laid within it, so that absolute concentricity is assured. These inner "tubes" are produced to approximate lengths on draw benches from a flat strip of aluminium bronze, after which they are straightened, end-swaged and trimmed. The filling operation carried out by machine consists of packing in the powdered filler, moistening slightly and forming, with a hardened steel wheel, a groove for the resistance spiral, which is then laid in position and covered with further refractory insulation. Final assembly consists of inserting this unit inside an outer protective sheath, which is then rolled down to a tight fit. Further processes consist in bending to correct shape using hand jigs and welding on the necessary lugs and supports. For "black heat" elements an aluminium bronze is used, but this is replaced by nickel alloys in the case of radiant boiling plates.

It is, of course, important to ensure that resistance

Aerial view of the G.E.C. Works

Laying resistor coils in the embedded type hotplates

spirals are accurately stretched to the correct length, and this is ensured by a stretching operation carried out in a bench fixture which accommodates half a dozen elements in quick-release terminals. While under tension they are heated by the passage of a current, which thus anneals them and allows of a permanent set, thus ensuring uniform length.

Solid type hot plates, after machining, have the insulating material applied in the form of a pasty cement. The spiral grooves in the insulating material are cut by means of a profiling tool in a hand-operated turntable fixture, the tool being guided by the ridges left in the casting itself. So abrasive is the insulating cement that it has been found better to use a profiling tool stamped out of strip, and to change the tool every dozen or so operations, using a quick-release toolholder and returning the tool for re-cutting, rather than to use carbide tools.

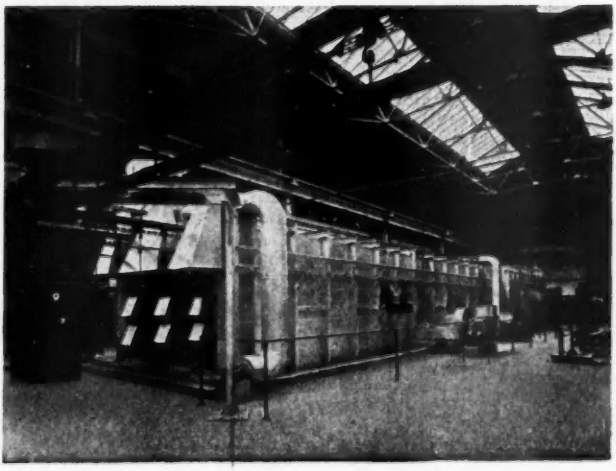
Elements in this type are stretched by hand to the operator's own judgment. After assembly, the hotplate is filled up with additional insulation, baked and tested.

Cooker Bodies

The body is produced from castings and pressings by methods that are fairly orthodox. Extensive use of spot welding is made, not only for actual assembly work but for tacking parts together prior to acetylene or seam welding, where these methods are more appropriate to the problem. An interesting detail observed was the welding of studs to sheet parts destined for vitreous enamelling. Instead of using studs directly welded to the sheet, the practice is to use countersunk screws welded to small plates about 1¼ in. by ½ in. in which are punched a countersunk recess and two small dimples, which are afterwards used for projection-welding to the main plate. This, it was stated, distributes the pull better and eliminates the crazing of the enamel on the other side.

Shot-blasting for castings and de-greasing and pickling for sheet steel parts precede the actual enamelling which is applied by dipping, hand spray and, in the case of larger surfaces, by an automatic spray plant recently installed. The enamel used is leadless and is prepared on the premises, the frit being ground in ball mills varying in capacity from 600 lb to one ton. After spraying, drying takes place to the "biscuit" stage in steam-heated ovens, after which any removal of the top coat for decorative purposes takes place.

Fusing of the enamel is carried out in five furnaces, four being batch-fed and one of the



One side of the 75 ft electric vitreous enamelling furnace

continuous type. This latter is electrically fired, and is 75 ft long with a conveyor belt of nickel alloy nearly 400 ft in length. The entire furnace, which incorporates the latest design features of British and American practice, was built by the Swinton engineering staff.

Enamelling is followed by inspection and re-threading of tapped holes and screws to ensure freedom from enamel. There is a modern de-enamelling plant employing molten caustic soda for treatment of damaged parts and rejects, the importance of this being emphasised with the growing metal shortage.

Assembly

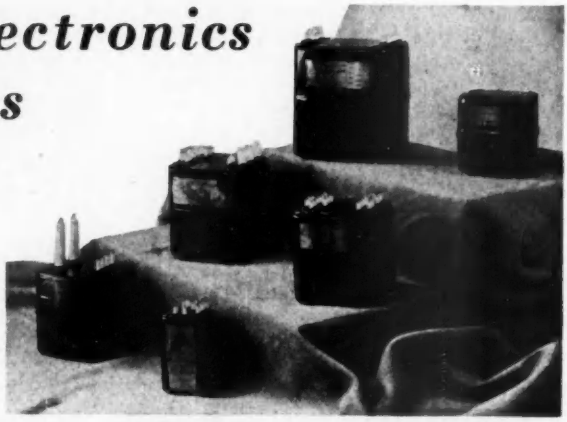
Finished parts, after inspection and testing (including consumption tests for elements), go to the finished parts store, from which they are fed to the main assembly lines. Conveyor assembly was considered not sufficiently flexible, and the use of separate turntable trollies is preferred. Assembly commences with the main frame and oven body, after which the trolley passes down one of eight lines. Running parallel with the main lines are sub-assembly benches at which the components needed for the particular operation are themselves assembled. Each station is numbered and a system of hand-operated semaphore signals warns the stores that fresh supplies of components will shortly be required at that point. Assembly is under continuous inspection, while on completion thermostat settings, circuits and insulation resistance are checked,

Wiring a DC 114 cooker on the assembly line

a 1,000 V flash test is applied and a pre-heating test is applied on a number of units up to twelve at a time. Each is subsequently tested and checked, and if it should be necessary, any modifications are carried out in a service section so that normal line flow is not disrupted. Cookers are then sent to a central stores for distribution. Export cookers are frequently packed ten to a case. This, rendering manhandling impracticable, has resulted in marked diminution of transit damage.

General view of two assembly lines showing main and sub-assembly stations

Radio & Electronics Components Exhibition



GROSVENOR HOUSE HOTEL, LONDON, WAS SCENE OF THE EIGHTH R. E. C. M. F. EXHIBITION

IT is a truism that the strength of a chain is that of its weakest link, and it is equally true that the reliability of an electronic circuit is that of its weakest component. In these days, however, with the steadily increasing reliance being placed on electronic gear for navigational, communication and industrial purposes, the manufacturers of electronic components are reaching ever higher standards of reliability, and it is probably not incorrect to state that the weakest link is now the valve.

The progress made in component design is well exemplified by the equipment being shown at the Exhibition of Components held at the Great Hall, Grosvenor House, in the earlier part of this week, where over 100 firms exhibited components, valves and test equipment.

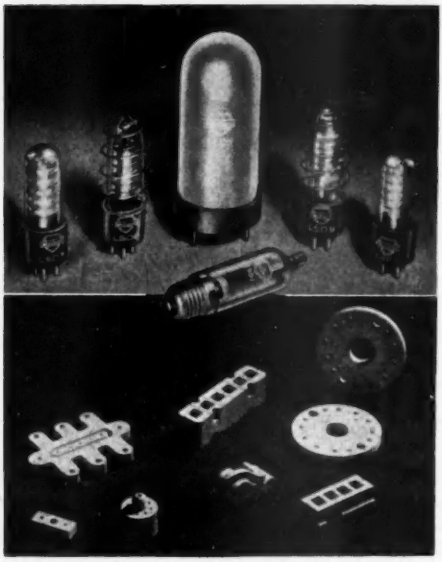
Test Gear

Several firms were exhibiting multi-range test sets, among them the well-known Avo series produced by the Automatic Coil Winder and Electrical Equipment Co. Salford Electrical Instruments—in connection with G.E.C. —had the "Selectest," as well as several dynamometer type instruments. The same firm also showed a quartz crystal activity tester. Taylor Electrical Instruments included three new models in their range; the types 72A and 77A in moulded cases with over-load protection and the Type 88A in a wooden case with a single linear scale for all ranges.

Sangamo Weston Ltd. had on view the S.75 Universal Test Set, the Model E.772 analyser and a newly developed E.H.T. voltmeter, while Dawe Instruments had a representative range of measuring instruments of all kinds.

Transformers and Coils

Transformers, both for radio and for power frequencies, were shown by a large number of



From top to bottom : A selection of transformers made by Parmeko. Some of Mullard's flash tubes and, finally, a selection of ceramics by Geo. Bray

firms. Ferranti had developed a range of miniaturised hermetically sealed types utilising "C" core construction and designed to the Interservices Spec. RCS 214. "Gecalloy"-cored coils and G.E.C. loading coils were on Salford Instrument's stand. A great variety of transformers for all purposes were shown by Parmeko Ltd., who again had hermetically sealed "C"-core types to conform with RCS 214 and 215, as well as power, luminous tube and low voltage lighting types. Winding machines for all types of work were shown by Acweeco. Plessey were also showing, among

their great variety of components, coils cored with "Caslam" material.

Resistors and Capacitors

In the field of fixed resistors and capacitors, the accent is still on miniaturisation. Erie Resistor Ltd. had a wide selection of both fixed and variable resistors including several new models. Of particular interest are the high-stability fixed types, fully tropicalised. Fixed capacitors and trimmers include the Teledisc ceramicon, to be shortly in production, and the type 325 stand-off ceramicon, both for use in confined spaces, and the types 531 and 557 trimmers.

Other firms showing in this section were Egen Electric Ltd. who had an improved midget pre-set variable resistor, Morganite resistors, and Dubilier Condenser Co. who showed a wide range of capacitors and resistors. Of particular interest was the hermetically sealed wire-wound potentiometer designed by the British Electric Resistance Co. for Service use under the most arduous tropical conditions.

Cables

Radio-frequency cables and accessories suitable for operation at frequencies as high as 10,000 mc/s were being shown by the Telegraph Construction and Maintenance Co. Ltd. The latest type of air-spaced coaxial cable having as a spacer a helical membrane of Telcothene was displayed.

British Insulated Callenders Cables also showed a comprehensive range of wires and cables including Bicalex and Bicaloc covered wires. Multi-unit cables exhibited by B.I.C.C. include television camera cables and "Polypole" multi-way couplers. Many other radio-frequency and special cables were also shown.

Other firms showing cables were the Edison Swan Electric Co., Reliance Electrical Wire Co. (who had two interesting specialities, all-rubber coiled extensible cords, and suppressors and filters moulded into the cables), Lewcos, and S.T. and C. Co.

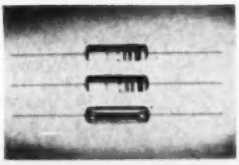
Miscellaneous Items

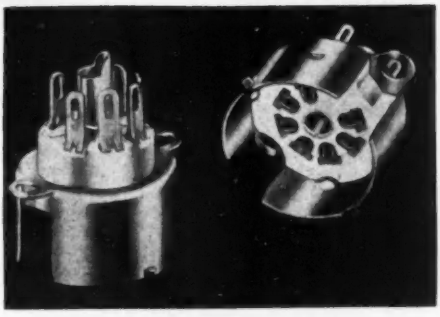
The range of valves on view was of course most extensive, firms showing included Edison Swan, Ferranti, G.E.C., Mullard and S. T. and C. Many new and old ferro-magnetic materials were being shown.

An unusual item was a sector of an 8 ft dia. "doughnut" for a 300 MeV synchrotron made of "Frequentite" and exhibited by Steatite and Porcelain Products.

Rectifiers were shown by S.T. and C., who had an entirely new range of low-current tubular rectifiers of the selenium type with current ratings of 1·0 and 5 mA. From Westinghouse Brake and Signal Co. were e.h.t. rectifiers for television purposes and types for aircraft duty.

Wide ranges of general components were shown by Bulgin, Plessey, Clix, and A.B. Metal Products and solders of various types were exhibited by Du Bois Co., H. J. Enthoven and Sons and Multicore Solders.





Top left is a section of a "doughnut" for a 300 MeV synchrotron made by Steatite and Porcelain. Beneath it is the Sangamo Weston e.h.t. voltmeter. Top right are some insulated high-stability resistors by Erie and below is the Plessey B7G ceramic valveholder

The E.A.W. Conference

ANYONE unacquainted with the high standing that the Electrical Association for Women has attained both within and without the industry, would have been agreeably surprised, at the annual luncheon last week, at the excellent attendance and the distinction of the top table which included no less than three Ministers. The President, the Dowager Lady Swaythling, was in the chair.

It was the Minister of Fuel and Power, the Rt. Hon. P. NOEL-BAKER, who proposed the toast of "The Association". He regarded it as a voluntary form of social service to help the nation to make the best use of electricity. It was responsible for educating the housewife in avoiding the peak and to prevent waste. In speaking of load cuts he said that no-one can estimate satisfactorily the loss to the nation, but the loss in production including that of exports was of the order of eight to ten million pounds. Fortunately, since Christmas there had been a saving of forty to fifty thousand tons of coal due to economy by the housewife and industry. Electricity will go on expanding, he said, and it is estimated that by 1970 the consumption will be three times its present value, and as the demand increases, so will the drudgery of women in the home be lightened.

The response to the toast was by MRS. M. E. STEWART, Chairman of the Perth E.A.W. Branch. She thanked the Minister for recognising the important part of the housewife. Urban dwellers, she said, do not recognise the great change that is brought about by electricity. Only those who know how hard is the life in the lonely croft can appreciate the miracle achieved by electricity.

The second toast, that of the British Housewife, was proposed by MR. W. L. BATT, Minister in charge of the Economic Co-operation Administration. He spoke very much of the activities of American women and pointed out they had stimulated the competition which had led to a better standard of living in that country. They are taking an increasing place in communal life, but this cannot continue unless women are freed from the drudgeries of home life by electricity.

The reply was by the Rt. Hon. EDITH SUMMERSKILL, Minister of National Insurance, who mentioned that this was the first time that she had been considered as a representative of the British housewife. Whatever women may do in social life, they have, she said, an essential interest in the home and all the activities associated with it. The housewife's life is dominated by that tyrant, the sink. Improvements had been made in the kitchen, but the sink was its unpleasant old self. "Why not a pink sink?" she asked. "It would considerably brighten the housewife's lot."

Annual General Meeting

The President, the Dowager Lady Swaythling, at the Annual General Meeting presented past officers' badges to Mrs. A. B. Lewis and Mrs. G. A. Tatchell, and awarded to Mrs. A. T. Dover the Lady Hughman Challenge Bowl as winner of the Golf Competition. Dame Caroline Haslett outlined the report of the National Executive Committee which was adopted. The new chairman is Mrs. A. T. Dover and the hon. treasurer, Mrs. A. B. Lewis. The ballot for the five vacancies to the National Executive Committee resulted in the appointment of Clr. Miss Nora Balls, J.P., Mrs. D. Coulson, Miss N. Kenyon, Miss H. Shaw, B.SC., and Mrs. H. F. Truman.

CANADIAN WATER POWER

AT the end of 1950 Canada had developed nearly 23% of its water power resources, according to the bulletin just issued by the Department of Resources and Development. It was an outstanding year in that a total of 962,275 h.p. of new capacity was brought into operation, making the installed capacity at the end of the year 12,562,750 h.p. About 88% of the water power plants serve as central electric stations—11,070,714 h.p. to be exact.

An analysis of development shows that water power generation is considerable in all provinces except Prince Edward Island where resources are small. The highly industrialised provinces of Ontario and Quebec contain nearly 47% of the total, and indeed have utilised more than 37% of their recorded total reserves. Of the plant put into operation, a large proportion represented the culmination of the post-war construction programme undertaken by the Hydro Electric Power Commission of Ontario. This included the Des Joachims project, with seven 60,000 h.p. units; Chenaux, also on the Ottawa River, having two 20,000 h.p. sets; the Tunnel site with 56,000 h.p.; and Pine Portage where two 40,000 h.p. sets were installed. The Quebec Hydro Electric Power Commission brought into operation the first two 55,000 h.p. sets at the Beauharnois No. 2 power house. Other notable additions to the generating capacity were in Manitoba, where the Winnipeg Electric Co. put into operation the fifth 37,500 h.p. unit at its Seven Sisters plant, and in Nova Scotia, where the Power Commission completed a 12,800 h.p. development on the Mersey River.

The pulp and paper industry ranks highest in Canada in the use of hydraulic and hydro-electric power—its overall consumption being about 25% of the total output of the country. And lastly, there is now an average of 907 h.p. developed per thousand of population throughout Canada.

Problems and Practice

IN ENGINEERING

Interpoles Short-Circuited

THE main d.c. generator at an engineering works was reported recently to be sparking severely at the brushes. The machine was an 8-pole, 600 V, 600 kW compound generator with interpoles, driven by a steam turbine through gearing. The sparking trouble had commenced suddenly, and no alteration to the load on the generator had taken place to cause overloading. The sparking was so severe that the machine was stopped to allow an inspection to be made. One need not describe all the tests which were made, but it was several hours before the cause was located.

The connecting straps between the interpoles and between the series field coils were arranged to obviate the magnetising of the shaft by currents flowing in them, and as a consequence they were longer than those necessary to connect two adjacent coils, and thus less rigid. The connections were of bare copper strip and, as it transpired, they were insecurely spaced apart. It was eventually found that two adjacent connections had come into contact with each other, the result being that the interpole circuit was short-circuited, making the interpoles inactive. The sparking was entirely due to this removal of the interpole field, and on separating the connections the machine ran sparklessly on full load. The connecting straps were suitably wrapped with insulation and adequately braced to prevent further trouble from a similar cause. The fault was not easily detected as it was at the lowest part of the machine, and only a narrow space separated the side of the generator where the fault was located and the side of the turbine gearing case.—*V. P. S.*

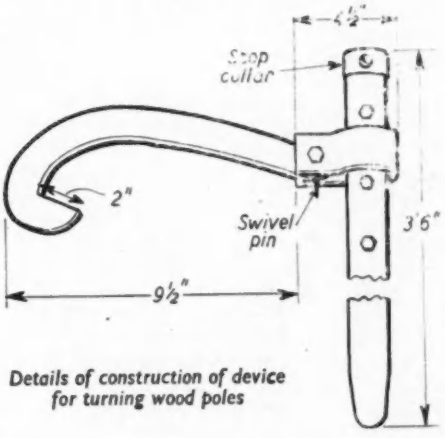
Electrode Boilers

SOME years ago we installed a 60 kW electrode boiler. When it was completed, and the supply switched on, with the electrodes uncovered to the maximum position, the boiler did not warm up at all, and an ammeter read just over zero. After a time, I remembered that the water in the district was very pure, and a small amount of soda was placed in the header tank. The current soon increased, and since then we have successfully dealt with boilers up to 600 kW rating in a similar fashion. In any case where water is drawn off, a calorifier is necessary.

The amount of soda ash used varies with the size of the water system, from about $\frac{1}{2}$ lb for a 60 kW boiler with a small circulating system to 10 lb for central heating with a 600 kW boiler and a large storage tank. It is better to add too little soda than too much, and as long as a reasonable output can be obtained, more soda should not be added for a couple of days. During this time the resistance of the water will gradually decrease and become more constant. Once the necessary output is attained, no loss of solute, necessitating replacement, should occur.—*J. H. D.*

Tool for Pole Turning

WHEN erecting l.v. lines it is very often necessary to turn poles erected into position and which have already been fitted with insulator shackles, etc. A tool was made up to enable this to be done with comparative ease. It consists essentially of a claw iron which swivels in a clamp fitted to a short,



Details of construction of device for turning wood poles

fairly stout wooden shaft. A sketch of the tool is shown. In use the clamp is set at the required stop and slung around the pole and pressure applied until the tooth grips the pole, which can then be turned with ease.—*C. Pearson.*

Alternator Field Suppression

IN his article on "Alternator Field Suppression," (March 8) C.B.Y. has made several incorrect assumptions. The most important of these depends upon what is meant by an inadvertently opened field circuit. It appears from the remainder of the article that an open circuit of the rotor winding or the cabling between the rotor and exciter is implied, but not opening of the field suppression switch or failure of excitation due to a fault on the exciter. Should this fault occur and the stator remain connected to the busbars because of the lack of protective devices to cater for such an unusual fault, the machine would no longer generate and its load would be thrown on to the machines running in parallel on the busbars, with possible undesirable results if it is a large machine running near full load. Under these conditions the alternator is electrically identical to a wound rotor induction motor with the rotor circuit incomplete. This means that the stator will draw a magnetising current, supplying the iron losses of the alternator, no torque is produced in the rotor if it is stationary or rotating below synchronous speed, nor will the alternator generate as an induction generator if driven above synchronous speed. This is because any induction machine, motor or generator, must have the rotor circuit completed internally or externally in order that the induced E.M.F.s may cause current to flow in the rotor conductors. The speed of the rotor would be determined by the governor characteristics and any overspeed devices fitted on the prime-mover which would be running in an unloaded condition. It can hardly be said that on open circuit on the rotor would remain unnoticed for long under normal working conditions.

Suppression of the rotor field when an internal fault occurs on the alternator is required as soon as possible. This can most easily be done by a circuit breaker (field suppression switch) between the rotor and exciter. This, however, gives rise to difficulties in as much that the opening of an inductive circuit of such a size is going to cause a considerable e.m.f. to be induced in the rotor windings as the field collapses. To prevent this e.m.f. reaching a value dangerous to the insulation a discharge path through a shunt connected resistance is used. If this resistance is of too low a value or if the rotor was simply short-circuited, the current flowing would tend to maintain the rotor field, a most undesirable condition. The solution is to use a resistance of as high a value as possible, keeping the induced e.m.f.s within the limits allowed by the insulation, yet allowing the rotor field to decay as rapidly as possible. The necessity for a discharge resistance will be realised when one considers how often warnings are given of the dangers of opening the field of a d.c. motor because of the likelihood of insulation breakdown. Comparing the relatively small field circuit of the d.c. motor with the rotor of a modern alternator of reasonable size, the motor field current may be measured in amps and the alternator rotor current in tens or hundreds of amps and also the much higher flux density in the rotor, it is easily seen that a discharge resistance is essential. Lack of a discharge resistance could mean unnecessary damage being done to the alternator under fault conditions or when the emergency trip, which operates the stator circuit breaker and field suppression switch simultaneously, is operated for some reason other than an electrical fault. It would also appear that these precautions are essential whatever rotor construction is used as the insulation is just as likely to be broken down if subjected to excessive voltages.—*H. R. H.*

. . . . and a Reply

I THINK the previous contribution was fairly clear and covered the points raised by H. R. H., but I agree that it is unlikely that an open circuit (as suggested by him) on the rotor would remain unnoticed for long under normal operating conditions.

Insofar as the opening of the field switch is concerned, opinions differ somewhat and some makers prefer to omit discharge resistances on certain machines. The elimination of discharge resistances improves the efficiency of the protective equipment in addition to reducing the cost by using a standard air breaker without resistances. The air breaker is not fitted with blow-out devices as it is not desirable to rupture the arc rapidly when the breaker is used. The arc acts as self-regulating resistance in series with the rotor field windings and prevents the inductive rise in the rotor voltage from becoming unduly high. The use of the slip-ring, short-circuiting switch is preferred by some makers but the discharge time appears to be about twice that obtained with the open-circuiting method. Discharge resistances are usually fitted to the pilot or service exciters. I thank H. R. H. for his interesting contribution to this subject.—*C. B. Y.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome and, if accepted, will be paid for at our standard rates.

Aircraft Electrification

Development of the System in the Brabazon Mk. I

A MODERN commercial airliner of large carrying capacity uses an unexpectedly large quantity of electrical equipment, and, owing to the importance of weight, the design of this gear is far different from that adopted for ground based equipment.

For this reason alone, the paper delivered to the Utilisation Section of the I.E.E. by Mr. M. J. J. Cronin last week was of particular interest.

Power Supplies

Beginning with the power sources, the author pointed out that the specific weight of a 500 W 12 V generator pre-war was 43 lb/kW. By adopting the 28 V 6 kW generator developed during the war, this had been reduced to 10 lb/kW, and by the later adoption of generator voltages of 208 V 400 c/s a modern 40 kVA generator weighed only 55 lb or 1·4 lb/kVA.

Voltage regulation was generally by carbon pile regulator, but switchgear presented some difficulty, as with large generator and back-up capacities short-circuit fault currents of the order of 20,000 amps were possible.

The "Brab" System

In the Brabazon Mk. I it was estimated that a total generating capacity of about 150 kW would be necessary to meet the total demand. As this demand was required to supply both a.c. and d.c. equipment, a 200 V a.c./28 V d.c. system was adopted using six 3-phase 30 kVA alternators and six 3-phase 6 kW rectifiers. A difficulty arose, however, in that power supplies were required over a wide speed range, 16 kW of 28 V d.c. power being needed at 720 r.p.m. (engine speed), the maximum engine speed being 2,800 r.p.m. This was overcome by using frequency sensitive relays to alter the tappings on the rectifier transformers, which enabled the alternators to provide 1,200 amps of d.c. power at $28 \pm 0{\cdot}5$ V and 30-144 kVA of a.c. power (*pro rata* with speed) over the 4 : 1 speed range. Excitation for the alternators was taken from the a.c. output via a rectifier and voltage regulator.

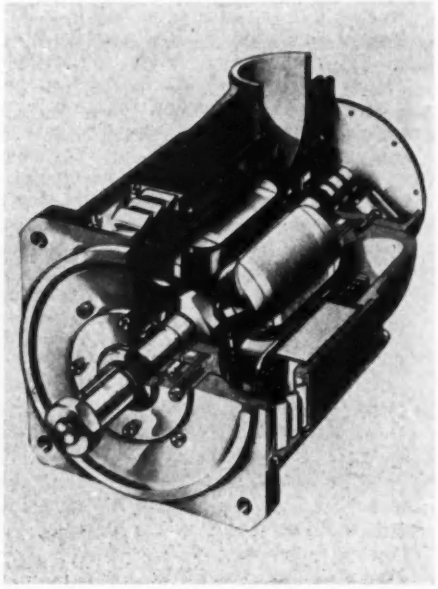
Load Distribution

From the electrical aspect the aircraft was divided into four parts: the two wings and the front and centre fuselage. The main electrical distribution centre was located in the section of the fuselage between the two wing spars and all the alternators fed into this centre. Since there were two d.c. load centres, one in the centre of the fuselage and one in the nose of the aircraft, rectifiers Nos. 2, 4 and 6 were connected in parallel to a busbar in the forward part of the aircraft and Nos. 1, 3 and 5 were in parallel in the electrical distribution centre. Local panels served as distribution centres for local services.

To cover alternator or gearbox drive failures, automatic transfer of a.c. loads was arranged by using contactors sensitive to loss of voltage or overload.

Equipment Design

Each main rectifier consists of 30 selenium plates connected to form a 3-phase bridge, and being made of special thin plate construction has a weight of 13·75 lb or a weight/power ratio of less than 2 lb/kW under



This cut-away view shows one of the main salient pole generators as fitted to the Brabazon

forced air cooling. The transformers supplying the aft rectifiers are star/star connected with three tapping points on each phase of the primary and two on each phase of the secondary. The primary tappings are used for alternator voltage selection and the secondary ones are used for the rectifier supply and a small amount of 28 V a.c. lighting. The design input voltage is 27 V at 171 amps (8 kVA), the core being operated at 10,000 gauss and the windings at 13,000 amp/cm². The weight is 29 lb.

The frequency sensitive relays consist of twin resonant circuits operating two polarised relays. One is biased to its high speed position at 250 c/s and above, and the other to its high speed position at 360 c/s and above.

The weight of a single power supply channel thus works out at—alternator, 55 lb; compounding unit, 16 lb; transformer rectifier unit, 67 lb; frequency sensitive unit, 4 lb; voltage regulator, 9·5 lb; switchgear, protection equipment, etc., 50·5 lb. Total weight is thus 202 lb.

The paper continued by giving details of some of the tests carried out on the system.

Utilisation

All heating loads, starter motors and other a.c. motors in the aircraft are connected to the a.c. system forward of the rectifier tapping transformers, and thus operate from a variable-voltage variable-frequency supply.

The propeller anti-icing equipment is by far the biggest single load on the aircraft, being about 72 kW for the whole installation.

This system relies on the complete evaporation of all water forming on the propellers, and is not to be confused with the de-icing system where ice is allowed to form and then thrown off centrifugally when heat was applied.

Each blade is covered with a fabric Neoprene base, coated with Farnivar compound which is made conductive by the addition of powdered graphite. Stranded copper conductors, embedded in the compound, are so spaced that when a voltage was applied to the slip rings a "film" of current is produced to give a graded heat distribution over the surface area of each blade. Windscreen heating requires about 8 kW.

As there are about 1,600 separately fused circuits in the d.c. side, it is impossible to describe these in detail. Special a.c. supplies at 400 and 1,600 c/s are obtained from inverters running from the d.c. side.

The system proved most satisfactory both in ground testing and in flight, and although modifications have been made, they were more in the nature of refinements rather than a change in the basic design.

DISCUSSION

DR. E. A. WATSON (Lucas) said the first impression given by the paper was one of complexity, which perhaps arose because the mechanical engineer had not made a good job of his side of the work; if he had provided a constant speed drive everything would have been very simple. The small gas turbine would be an ideal drive for an alternator and the constant-speed a.c. system which everyone desired.

MR. C. G. A. WOODFORD (Consultant) illustrated a method of load transfer switching which, he claimed, showed that it was possible to develop a very simple standby system giving full reliability of supply to essential services.

MR. R. H. WOODALL (Rotax) suggested that constant speed drive was desirable not only for a.c. machines but equally for d.c. machines in order to save weight.

MR. V. A. HIGGS (B.T.H.) was sorry that the Brabazon and the Saunders-Roe Princess had been developed without the parallel development of a gas turbine auxiliary generating plant. He was convinced that the electrical industry could develop a gas turbine auxiliary generating plant which would give a first-class system for future large aeroplanes.

MR. J. F. LEWIS (Ministry of Supply) thought there was still uncertainty about the choice between a.c. and d.c., at least for larger aircraft. While constant speed drives were still not available to give acceptable reliability and life, he wished that a turbine-driven auxiliary generating plant had been developed.

MR. E. R. LLOYD (Air Registration Board) urged that as much attention should be paid to auxiliary supplies as had been given to the main supplies. A great deal of complexity could be avoided, weight saved and greater reliability achieved by having a central supply for these services at a fixed frequency.

MR. J. CLYDE (Ministry of Supply) said that a good deal of development work had been carried out in this country on constant speed drives, primarily on the mechanical side, but up to the present there was not a gearing light enough for aircraft. The Americans had developed a hydro-mechanical gear, but it was rather heavy. Before a constant-speed gear could be applied to aircraft its weight should be of the order of 1-1½ lb./h.p. and it should give at least 1,000 hours trouble-free operation.

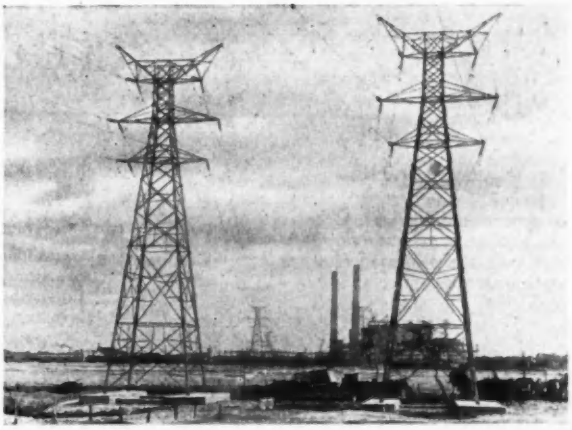
MR. I. O. HOCKMEYER mentioned that one aircraft, the *Shetland*, had been fitted with an auxiliary generating plant as long ago as 1940 and was very successful until somebody ran the auxiliary plant without opening the cooling ducts.

MR. J. G. M. PARDOE, speaking as an aeronautical engineer, said that if electrics were to be used for essential services such as power-operated controls it would be necessary to have not one auxiliary generating plant or even two, but three.

DR. C. A. V. SOWTER and MR. S. A. STEVENS also took part in the discussion, to which the Author replied at some length.

132 kV Link with Poole

W.T. Henley's Engineers complete twin transmission lines linking Poole Harbour Station with the Grid System despite difficult site conditions



Right are seen the twin transmission lines crossing the marsh to Poole

THE new B.E.A. Southern Division 200 MW generating station at Poole Harbour which was brought into commission at the end of 1950 is supplying energy into the grid over the 132 kV overhead lines erected by Henley's.

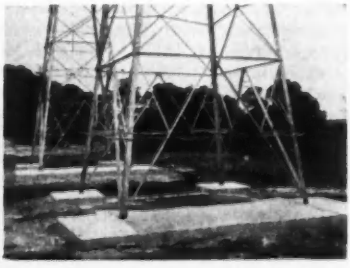
The new station site is a reclaimed marshland area on which enormous quantities of material had to be tipped to build up the site above flood level. Several of the overhead line tower foundations sited on the marshland required particularly heavy foundations, and it was these features, coupled with the nature of the approach to the power station, which gave the overhead line contract some rather unusual aspects.

Henley's contract with the B.E.A. provided for the erection of two 0·175 sq in. s.c.a. double-circuit steel tower lines approximately 6 miles and 2½ miles long, both emanating from the power station switching compound. The shorter line loops into the existing Bournemouth-Dorchester line and the other runs direct to Bournemouth. Both new lines from Poole Harbour power station carry 0·07 sq in. s.c.a. earthing conductors.

The bearing strength of the soil at six out of the first seven tower positions from the power station on each line was so low that reinforced concrete piles had to be driven for the tower foundations. The tension loadings on the towers had to be compensated by mass concrete foundations, and the high-tide level over the marshland area was another factor which necessitated this construction.

It will be noticed from the illustrations that the mass concrete foundations are continued well above ground level. This was necessary because it was impracticable to excavate to a greater depth than 5 ft in the marshland.

We are indebted to the Southern Division of the B.E.A. for permission to publish these notes and the photographs.



The tower footings shown above show the raised foundation blocks. Whilst left, workmen are seen excavating the tower foundations at the end of the access roads; the concrete pile tops are protruding

overseas news

Geothermic Interests

Iceland is the latest country to consider the use of geothermic power. An interesting scheme for the utilisation of subterannean steam in connection with the proposed establishment of a power station, is now under review by the Hafnarfjordur municipal electricity works. For some years, experts have conducted drillings at Krysuvik, a hot spring tract about 25 kilometres from the town, and of late results have been achieved sufficient to indicate that a generating plant of up to 3,000 kW could be planned. Drillings are being continued but, with Italy's experience in mind, it is believed that this plan will only be the first of a series of such stations in the country utilising subterranean steam. So far, two methods have been considered, one, to pipe the steam directly to the turbine after separating the water, after which it is passed to a steam condenser, and secondly, to pipe the steam into a boiler in which its heat would serve to generate new steam at lower pressure for the turbine, afterwards going to a condenser. Having got so far, the Hafnarfjordur municipal undertaking now wishes to contact manufacturers who could help in regard to supplying a 3,000 kW turbo-generator and associated equipment, boilers, two separators for separating water from steam at the borehole, and pumps. Interested concerns should communicate direct with Rafveita Hafnarfjordur, P.O. Box 26, Hafnardirdi, Iceland.

Tasmania's Advance

The new power station at Butlers Gorge, with a capacity of 17,000 h.p., is expected to be put into operation by the Hydro-Electric Commission of Tasmania this month, Mr. Cosgrove, the State Premier, announced recently. But, initially, the output will be much lower, for heavy rain is needed to fill Lake King William. It was also anticipated that another 22,000 h.p. would be available from Tarraleah at the end of the year. The machinery had arrived, but difficulty was being experienced in getting enough electrical fitters.

Plant for Eildon

The State Electricity Commission of Victoria too, has just placed orders with Boving and Co. Ltd., and the British Thomson-Houston Co. Ltd., for generating plant for the Eildon Weir hydro-electric power project. The former company is to supply two 82,000 h.p. vertical Francis water turbines, to run at 150 r.p.m., while the B.T.H. order is for two 60,000 kW generators. An unusual feature of the scheme is that the turbines will be provided with three runners which are to be interchangeable, in view of the fluctuating waterflow, to operate on heads ranging from 77 ft. to 235 ft. The turbines are believed to have the greatest output and the alternators to be physically the largest ever ordered in Britain. The overall diameter of the alternators will be about 40 ft. and each will weigh approximately 500 tons. Each set will be rated 66,667 kVA, 11,000 V, 3 phase, 50 cycles. The plant is to be delivered late in 1953. The order also includes a 250 ton gantry crane. Eildon power station is associated with a large combined irrigation and hydro-electric scheme on the Goulburn River. During the construction of the new dam the small power station at the existing Eildon Weir will be completely buried, the generating plant first being removed, and installed in the new Eildon power station, where it will be used at times when only limited quantities of water are available.

Another N.S.W. Order

A contract for two 25,000 kW water turbine alternators for the new power station at Hume Dam has been placed with the English Electric Co. Ltd. by the Electricity Commission of New South Wales. It was just over two years ago that it was decided to go ahead with this project, which involves enlarging the storage capacity at the Hume Dam from 1,250,000 acre feet to 2,000,000 acre feet. Cost of the scheme was put at £2,000,000, and it was stated that the station's annual output of approximately 206 million kWh would be shared equally between New South Wales and Victoria who will also share equally the cost of upkeep. But N.S.W., within whose boundaries the station is being built, is to be the controlling authority. The new power station was designed by the State Electricity Commission of Victoria.

Line Extensions

The chairman of the South Burnett Regional Electricity Board (Councillor T. H. Spencer, of Goomeri) has told the Wondai Shire Council, Queensland, that the Board was budgeting for an expenditure of £68,500 for electricity extensions in the Wondai Shire in 1950-51. This included £47,000 on the Barambah Creek, Mondure, Hivesville, and Proston extensions. Other items were £12,500 for rural extensions, £1,500 Wondai waterworks line, and £3,000 to be expended on extensions in the Cushnie area.

Shawinigan Expansion

Another large hydro-electric development may have to be built to satisfy the expected increase in demands for power in the next few years, shareholders of the Shawinigan Water and Power Co., Montreal, were told at the company's annual

meeting recently. Power resources are expected to be adequate up to 1953, but new and additional capacity will be needed thereafter. A probable site was at Rapide Sans Nom, on the St. Maurice River 10 miles above La Tuque, where a 252,000 h.p. plant could be built, it was stated, but warning was given that such new development would incur heavy expenditure.

Expropriation

Although hearings were completed about a year ago, no statement has yet been made by the Arbitration Board on the matter of compensation to be paid to shareholders of Beauharnois Light, Heat and Power Co., following expropriation of its assets by the Quebec Hydro Commission. After the hearings it remained for the board to study the written representations of counsel for shareholders of the Commission. At the final hearing counsel for shareholders asked for compensation of $63,927,719 to be divided among stated minority holdings of 187,000 shares.

Seaway Project Again

A more optimistic outlook in regard to the St. Lawrence seaway and power development, was taken by Mr. R. H. Saunders, chairman of the Hydro-Electric Power Commission of Ontario, following his visit to Washington a few days ago. He declared that the U.S. Congressional Committee report would be favourable and some real progress should at last be made.

Fire Damage

Fire seriously damaged the Chandoline hydro-electric plant near Sion, in Canton Valois, last week. The damage has been estimated at £1,000,000. Of 258,800 h.p., the plant is one of the most important in Switzerland. It will now have to be completely rebuilt, according to reports.

Quebec Development

Preliminary work is already under way in connection with the first important power development on the North Shore east of the Saguenay River, the Manicouagan Power Company reports. Construction work will commence in the spring. The company is to develop the first falls of the Manicouagan River, third largest in the province, about 250 miles down river from Quebec City. The development will be in two stages of 45,000 h.p. each, the first to be in operation not later than 1953. While its basic purpose is to supply reserve power to nearby Baie Comeau, site of a paper mill and nearby rural areas, the company hopes that by having power available it will be able to attract secondary industries to the area, 250 miles eastward along the St. Lawrence from Montreal.

Kashmir's Aim

The Jammu and Kashmir Government has set up two committees to draw up plans for utilising surplus electricity from the Sindh hydro-electric scheme in Kashmir and from Jogindernagar in Punjab. The committees will also help to co-ordinate power development and industrial expansion schemes. The first committee will examine and report on the uses to which electricity can be put in respect of agricultural development and development of tube-well irrigation. The other committee will draft a report on how electricity generated from the above two projects can be utilised for industrial expansion and the development of small-scale generators for cottage industries.

Protection

Following recommendations by the Pakistan Tariff Commission to grant protection to industries manufacturing electric fans and industrial-type switchboards, the Government of Pakistan plans to implement the recommendations in the near future, the Pakistan Minister for Commerce has told Parliament.

Lamp Production

Hindered by a shortage of raw materials, the Indian electric lamp industry has made considerable progress in the last 20 years, for it was only in 1932 that the first factory was set up in Calcutta by the Bengal Electric Lamp Works. Today there are eleven factories with a total production capacity of 24 million bulbs, but the target for the current year is 18 million, of which about 4 million would be an exportable surplus. So far, only general purpose lamps have been made, but some firms are now taking steps to manufacture fluorescent tubes. The import of plant from Japan and West Germany for the manufacture of miniature bulbs has been allowed by the Government, and the capacity of the three plants to be set up for this purpose will be for 9,500,000 only. At the present time, of course, there is a ban on the import of electric lamps of up to 500 W for general lighting purposes.

U.P. on the Upgrade

Electrification of the State of United Provinces has spread over an area of 16 million acres in the western districts in the past 22 years, and promises to extend to 15 million acres more in the central regions of the state in the next four years, according to the latest review of the activities of the U.P. Government. There are now seven power stations on the Ganga Canal, with an installed capacity of 18,900 kW and two steam stations at Chandausi and Harduaganj of 9,000 kW and 10,000 kW capacity respectively. Construction of the Khatima power station, with an installed capacity of 41,400 kW is in progress, and, on completion, this station will cater for the districts in the centre of the state on the north of the Ganga. For the eastern districts, preliminaries have nearly been completed for a large hydro-electric station to generate 187,000 kW from a storage of nine million acre-feet to be impounded by a 3,000-ft long and 300-ft high dam on the river Rihand, a tributary of the Sone, in the district of Mirzapur in the south-east of the state.

PERSONALITIES

IN THE INDUSTRY

Thirty-seven years connection with electricity supply in Wembley, will be ended on May 4 by the retirement of **Mr. T. Hollins,** A.M.I.E.E., district manager to the Eastern Electricity Board. He started with the nearby Watford undertaking, joined the Northmet Power Co. in 1914 as an assistant engineer at Tottenham, and transferred to Wembley 4 years later. At that time there were only 240 consumers in the area, but following the British Empire Exhibition the expansion of the district was very rapid, and tremendous efforts were needed to cope with the expanding demand. In this work Mr. Hollins played a prominent part. He was nominated resident engineer for Wembley in 1939, later becoming district superintendent, and ultimately district manager to the Board. We wish him a long and happy retirement.

Mr. T. Hollins

Until recently chief electrical engineer at Catterick Camp, Yorkshire, **Mr. T. Young,** O.B.E., A.M.I.E.E., Assoc.I.Mech.E., has this month taken up his new position of chief engineer to Selfridges Ltd., the big London store. He was at one time with Courtaulds Ltd.

We understand that **Mr. G. R. Millward,** M.I.E.E., M.I.Mech.E., has been appointed chief electrical engineer (special works) of the Sudan Government Department of Public Works at Khartoum. He was formerly superintendent electrical engineer of the Sudan Railways, being stationed at Atbara.

Forty-two years' association with the Cambridge electricity undertaking has ended for **Mr. P. J. Young,** who retired a few days ago. He was engineer to the old Cambridge Electric Supply Co. Ltd. and, since nationalisation, district engineer. He went to Cambridge, from Bedford, in 1909. Mr. Young has been presented with an electric chiming clock and a cheque, subscribed by colleagues and friends. The presentation was made by **Col. A. E. Knights,** manager of the Fens Sub-Area of the Eastern Electricity Board.

Combining their Patents Engineering Section with that dealing with design approval for overseas countries, Hoover Ltd. has nominated **Mr. V.A. R. French** to be responsible for co-ordinating this work on behalf of the company. Mr. French has been with the engineering department of the firm for some seventeen years.

Mr. F. Jasper Cole, M.I.E.E., M.I.Mech.E., technical engineer of the North Western Electricity Board's No. 5 Sub-Area since 1949, has been nominated manager of the Board's No. 7 Sub-Area, to succeed **Mr. J. Harwood Lumsden,** M.I.Mech.E., A.M.I.E.E., upon his retirement in July. Mr. Cole was borough electrical engineer at Blackpool from 1945 to 1948, and from then till 1949, was executive officer there. Mr. Lumsden is, of course, well known in the industry being chief engineer and manager of the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board before vesting day.

Mr. F. J. Cole

The new chairman of the Radio and Electronic Component Manufacturers' Federation is **Mr. W. F. Taylor,** O.B.E., director of the Telegraph Condenser Co. Ltd.

The North Western Division of the B.E.A. has promoted **Mr. J. Shepherd** and **Mr. C. E. Pugh** to positions of generation engineer (construction). Both were previously senior mechanical engineers (c) with that division. Prior to vesting day, Mr. Shepherd was with the Lancashire Electric Power Co., as resident engineer on Kearsley "C" and "D" extensions, having had earlier experience as designer with a structural engineering firm. Educated at Bolton Junior Technical School, he continued studies at Bolton and Salford Technical College and served an apprenticeship with a firm of mechanical handling specialists. Mr. Pugh, also, studied at Wigan, Bolton, Salford and Manchester Technical Colleges, and prior to nationalisation served with the Lancashire Electric Power Co. as assistant construction engineer.

Mr. J. Shepherd

Mr. C. E. Pugh

Formerly at the company's London district office, **Mr. J. E. Peck** has been appointed manager of the Edison Swan Electric Co.'s Southampton district office, in succession to the late Mr. W. J. Maddick. During his service with Ediswan, which Mr. Peck joined 28 years ago, he served his first two years in the technical department for tunsten special filament design, and followed this with three years in charge of carbon filament manufacture. Following this he was representative attached to the London district office. Joining the Forces in 1941, he served until 1945 as technical electrical instructor to the R.A.F. and the Fleet Air Arm.

Mr. J. E. Peck

After being 11 years on loan to the Ministry of Supply, **Mr. Clifford P. N. Rand,** M.A.(Eng.)Cantab., A.M.I.Mech.E., M.I.E.E., has returned to his former position of director of Electrical and Engineering Products, Ltd. That company, among other things, are representatives in the south of Bonar Long and Co., Ltd.

For twenty years manager of the South Wales territory of the English Electric Co. Ltd., **Mr. C. A. Smiles,** A.M.I.E.E., has relinquished that post for reasons of health, but his services are still available to the company in an advisory capacity. He is succeeded by **Mr. E. K. Wood,** A.M.I.E.E., formerly of the Cardiff office, who has been with the company for 15 years. Mr. Smiles served an apprenticeship with Crompton's, before joining the E.E.C. As manager of the South Wales territory he has been associated with many important installations, particularly in connection with steel works, in the area. Mr. Wood was in charge of the engineernig of magnetic minesweeping equipments during the last war, and was later appointed marine liaison engineer, Stafford. In 1945, he became resident liaison engineer with the Westinghouse Electric Corp. in Pittsburgh, U.S.A., and in 1947 went to the English Electric Co.'s Cardiff office.

Mr. C. A. Smiles

Mr. E. K. Wood

At present with the British Thomson-Houston Co. Ltd., **Mr. Bernard Adkins,** M.A.(Cantab.), M.I.E.E., A.M.Inst.C.E., Assoc. A.I.E.E., has been appointed to the University of London Readership in Electrical Engineering, at the Imperial College of Science and Technology. He takes up duties on October 1. As a design engineer with B.T.H. from 1928 until 1947, and from 1947 as a consulting engineer dealing with mathematical work in connection with special engineering problems, he has also been closely associated with the education of the firm's apprentices. From 1947, he has been organiser and senior lecturer of the B.T.H. Advanced Engineering Course, and has assisted in the selection and training of graduate and student apprentices. Since January last, he has also served as a special lecturer at the Imperial College for the post-graduate course on electrical machine theory. For it was in his early days at B.T.H. that he was engaged on experimental work on all types of a.c. machines. He has contributed many articles on the subject, and jointly with **Dr. W. J. Gibbs,** is co-author of a book on "Polyphase Commutator Machines" shortly to be published.

Mr. Bernard Adkins

Following the relinquishing by **Mr. J. M. Sykes** of his post in the Publicity Department of the English Electric Co., Ltd., to devote more time to other business interests, that Department has been re-organised and two new appointments made. **Mr. Peter Scott** who became manager of the Department since July last, is now joined by **Mr. R. Johnson** as assistant publicity manager and **Mr. M. Logan,** M.A., as press relations officer. Mr. Johnson was previously senior export representative to Gillette Industries, Ltd., while Malcolm Logan was, until recently, editor of *Advertising and Marketing Review*. The re-organisation does not affect the Publicity Department in Stafford which remains under **Mr. M. B. Schroeder** who is Mr. Scott's deputy at Stafford.

In the examinations held earlier this year by the Institute of Municipal Treasurers and Accountants there were eight successful candidates employed by Electricity Boards. Five of these, in the Intermediate examination, were Messrs. **V. Evans** (Eastern), **C. D. Lewis** and **D. J. S. Parnell** (South Eastern), **L. Poley** (South Wales) and **J. D. Sainsbury** (South Western Board). In the final exam, Part I, **Mr. S. Dry** (Yorkshire Board), was successful, and in Part 2 Messrs. **G. K. Bourne** (South Eastern) and **D. H. Fisher** (Eastern Board), passed. Having passed Part 1 on a previous occasion, the latter two are now eligible to apply for Associate Membership of the Institute.

New manager of the Leeds district of the Yorkshire Electricity Board is **Mr. B. Nuttall,** M.I.E.E., A.M.C.T., who previously held a similar position at Huddersfield. Prior to going to Huddersfield in 1945 as deputy borough electrical engineer, he had been chief technical assistant and constructional engineer in the Nottingham Corporation Electricity Department for some thirteen years, after gaining earlier experience with Ferguson, Pailin Ltd.

Mr. Branson Nuttall

In succession to **Mr. J. C. Fairchild,** who has retired, **Mr. H. T. Timberlake,** A.M.I.E.E., has now taken up his appointment of commercial engineer, South West Fylde District, with the North Western Electricity Board. He was previously planning and development engineer, Harrogate Sub-Area, and, prior to nationalisation, deputy borough electrical engineer and manager at Harrogate. Mr. Fairchild, to whose retirement we referred on January 18, was borough electrical engineer and manager at Lytham St. Annes prior to vesting day, it will be recalled.

Acting on behalf of H.M. The King, **Mr. Philip Noel-Baker,** Minister of Fuel and Power, last Friday presented British Empire Medals to a number of employees in the fuel and power industries. The electricity industry recipients were:—**Messrs. A. F. T. Brider** (boilerhouse foreman, South Wales Division), **G. H. Cowley** (conveyor attendant, Percival Lane power station), **F. N. Hunter** (boilerhouse fitter, Wallasey), **J. B. Boyd** (foreman linesman, South Western Division), **W. C. Wilkinson** (electrician, North Eastern Board), **J. Williams** (class 1 jointer, South Eastern Board) and **H. A. Hunstone** (charge hand electrician, Ocker Hill power station, Midlands Division, B.E.A.).

Left to right: Back row, J. B. Boyd, F. N. Hunter, A. F. T. Brider, and W. C. Wilkinson. Front row, H. A. Hunstone, J. Williams, and G. H. Cowley

Shortly taking up a new position at Sao Paulo, Brazil, as personal assistant to the engineer in charge of work for the British Insulated Callender's Construction Co., Ltd., out there, is **Mr. B. Crookes,** who has relinquished his job as mains engineer in charge of the Saxon Road, Sheffield, depot of the Yorkshire Electricity Board. **Mr. W. E. B. Nettleton,** sub-area engineer, made a presentation to Mr. Crookes on behalf of colleagues, a few days ago.

Mr. E. A. Armitage has been appointed by the St. Helens Cable and Rubber Co. Ltd. as an outside sales engineer, in the Yorkshire area, attached to their Bradford office. Mr. Armitage received his technical education at the Leeds College of Technology and prior to joining St. Helens was employed by George Ellison Ltd. at their Leeds branch as senior estimator.

Owing to continued ill-health **Mr. W. E. Lane** has resigned from the position of London manager and secretary of the Electricity Trust of South Australia. The London Office of the Trust, and of the Adelaide Electric Supply Co., Ltd., is now in the charge of **Mr. E. J. Finter,** as London registrar and accountant. **Mr. R. H. M. Lea,** the general manager and chief engineer of the Trust, in Adelaide, also tells us that with the facilities now available in air travel, it is hoped that more frequent visits from the senior executive in Adelaide, to London, will be a regular feature. It will be recalled that both Mr. Lea and Mr. L. J. C. Wigan visited London last year.

The Simplex Electric Co., Ltd., announce the appointment of **Mr. P. T. Wilby** as technical sales engineer and flameproof equipment specialist. Mr. Wilby has been specialising in the requirements of flameproof equipment for oil companies and has previously had technical experience with the aircraft industry.

On retiring after over 30 years' service in the electricity supply industries in South America, Spain and Great Britain, **Mr. W. J. Smith,** accountant, No. 3 Sub-area, South Western Electricity Board was last week presented with a pair of binoculars.

OBITUARY

Mr. W. Humphreys, a member of the old-established electrical concern of J. H. Humphreys and Sons, of Oldham, died recently, aged 74.

Mr. Sidney Wolfe, until recently, chairman of Wolf Electric Tools Ltd., died on April 3, aged 79. A trained engineer and designer, he was a specialist in sheet metal working machinery in his younger days; he founded the company in 1900.

The BUYER'S *Column*

Press-it-off plug by Clang

EVEN with the best makes of plugs and sockets one occasionally meets a plug which after insertion with no undue pressure, grips like a limpet, resisting all attempts at removal. Sometimes the uninitiated use a screwdriver to force out the plug with unfortunate results and in most cases the plastic casing of the plug is cracked and broken through the reprehensible but effective method of "rocking" it out.

To obviate all effort and trouble in removing plugs CLANG, LTD., Crown Yard, Cricklewood, London N.W.2, have now produced a 3-pin plug 15 amp with a special central rod set in a plug top, reminiscent of the old Home Office pattern. Thumb pressure on the central button, whilst the other fingers grip the flanged rim, enable the housewife or other person to remove the plug with ease.

The idea is fully patented and is to be shown at the B.I.F. The probable price will be 3s. 9d. retail. This plug will be known as the Clang Ejector Plug.

Profiles presented by Newton

UNIQUE in its field, we believe, is the profile projector designed and marketed by NEWTON & CO., LTD., 72 Wigmore Street, London W.1.

It is an instrument designed for gauging the dimensional accuracy of small machined parts, which offers many advantages to firms engaged in the production of these parts.

Summarising the many advantages the main virtues of the Newton Projector are: accuracy, simplicity, speed and durability.

In the first case the profile of the component is projected by a series of lens and prisms on to the screen upon which an enlarged outline is drawn, thus by comparison, profile, concentricity and tolerances may be checked with greater accuracy than other forms of gauge. As magnification is constant, all "human element" errors are eliminated, permitting the projector to be operated by persons with little or no skill. The manner in which the projector speeds up gauging operations is obvious whilst the only replacements needed are occasionally a new projector lamp, in comparison with the need for constant checking, maintaining and replacing of worn gauges of the ordinary type.

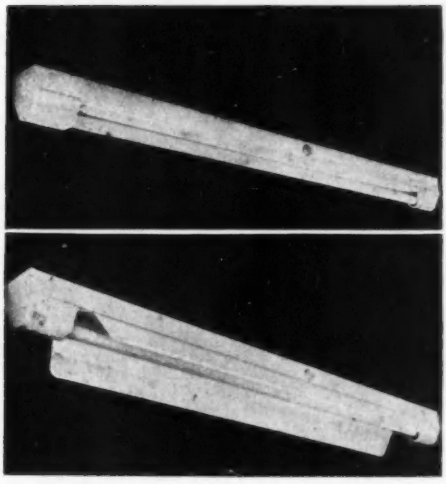
Newton's profile projector installed in the testshop means greater efficiency and higher output

New Mazda fittings have special Choke

NOW being marketed by the BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, London, is a new range of fittings for use with single or twin 5-ft. 80-W lamps. One of their interesting features is that they are designed to suit a new choke developed by B.T.H. and known as Type MRJ. This differs radically from existing types in that it has no compound or other filling, a great improvement in design achieved without the sacrifice of any of the qualities that hitherto it was considered only some form of filling could guarantee.

The Type MRJ choke is brick-shaped and is entirely enclosed in a metal structure having all external surfaces earthed. The whole unit is impregnated with a high quality varnish making it fully moisture resistant. A liberal margin of thermal capacity is allowed for in the design so

Mazda's new fittings are shown below. First is one of the F1050 series, whilst at the bottom is seen an example from the F1150 series



that even if the lamp or starter switch fails the choke cannot overheat. Designed with the emphasis on efficiency and lamp performance, the choke is virtually noiseless in operation.

The new Mazda fluorescent lamp fittings using the MRJ choke are known as Series F1050 and F1150. They are of robust construction, in best quality sheet steel, bonderised to prevent rust and are finished with a heavy stove enamel coating in light stone. All reflecting surfaces are white.

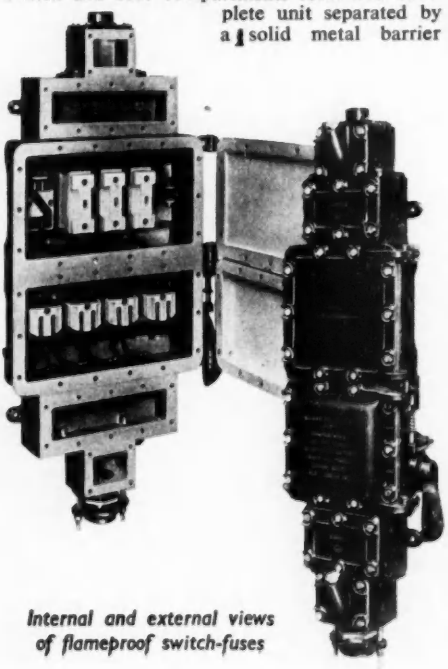
Fittings in the F1050 series are of the bare-lamp type, whilst those in F1150, identical in basic construction, are equipped with reflectors. These may be provided with upward light slots. Installation may be either direct on to ceiling or by conduit or hook suspension. The end covers, easily removable by a simple sliding movement, support the lamps without the need for spring clips. The channel covers or reflectors are also readily detachable, whilst the control gear, which is assembled on a tray, is removable intact, together with lamp leads, by loosening two nuts. Starter switches are permanently accessible through the side of the channel.

New Simplex Flameproof Gear

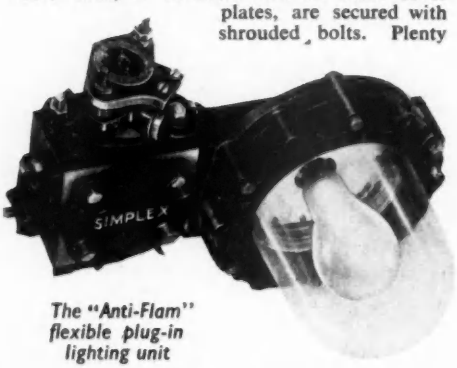
NEW additions to their range of flameproof equipment are announced by the publication of a number of descriptive pamphlets by SIMPLEX ELECTRIC CO. LTD., of Oldbury, Birmingham, together with a comprehensive price list for the entire range of gear.

Switch fuses, complying with BS 229 and 861, and certified for Groups 1 and 2 gases, are available in d.p., t.p., and t.p. and neutral arrangements in ratings of 15/30 amps and 60 amps at 500 V. A "Junior" model rated at 15 amps 250 V d.p. only is also available.

The general construction is simple and robust. Switch and fuse compartments form one complete unit separated by a solid metal barrier with insulated studs permanently wired as through connections. Separate hinged doors are fitted to both compartments, that covering the fuses being interlocked with the switch handle, while both, in common with all other cover plates, are secured with shrouded bolts. Plenty of room is provided for wiring and cable spreading—a point which should be appreciated by erection staff—and core glands or conduit entry can be provided as required.



Internal and external views of flameproof switch-fuses



The "Anti-Flam" flexible plug-in lighting unit

Another innovation is the "Anti-Flam" flexible lighting system, the basis of which is a four-way connector box with outlets, so that lighting units, extension cables (made-off and sealed on the surface) or switch units can be plugged as desired. The lantern unit (illustrated) has a robust cast-iron body which complies fully with BS 229 and 889 and is certified in conjunction with the connector box. Designed to take a 100 W lamp, it incorporates an internal heat deflector and reflector, and a standard well-glass fitting. Suspension holes are provided, and the "Anti-Flam" lighting range includes all accessories such as guards, fixing brackets, cable glands and blanking-off plates.

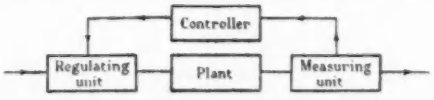
Other items in the complete range consist of conduit entry lanterns, floodlights, connection boxes, switches and a full range of flameproof conduit fittings.

Electronic Process Control

Operation and Advantages Described at I.E.E.

THE principles on which servo-mechanisms of the closed loop type operate are now well known, as this type of control system using electronic methods was brought to a high degree of perfection and reliability during the war. It was only reasonable to expect that the application of the system to process control would not be long delayed, and an interesting paper on the subject was presented to the I.E.E. last week by J. R. Boundy and S. A. Bergen.

Although not an "integrating" paper in the accepted I.E.E. sense of the term, it expounded the fundamental basis of electronic control concisely and clearly. The authors pointed out that the equipment fundamentally consisted of four units as shown in the diagram. The function of the measuring unit was to detect



Block diagram of closed-loop servo system

and measure the deviation of the output from the laid-down value, and to feed that error to the controller. The controller had to convert this error into an acceptable operating form and then feed it to the regulating unit which would take the required action.

There were three modes of control available from the controller. In the first, the action taken and the movement of the regulating equipment (V) was proportional to the error θ or $V=-K_1\theta$ where K_1 was a constant depending on the sensitivity. The second was proportional to the integral of error with respect to time and could be expressed by $V=-K_0\int\theta dt$. This removed the inherent drop of the proportional action, and the third was derivative action or $V=-K_2 d\theta/dt$, which acted in effect as a damping term. As it was only present when the error was increasing or decreasing and was unaffected by the magnitude of the error, it could only be used in conjunction with another mode of control.

Actual Equipment

The authors then described a mechanical/electrical transmitter for converting physical movement into a proportional d.c. current. This current, being proportional to the error function, was then fed into a controller circuit which gave an output such that $V=-K_1\theta-K_0\int\theta dt-K_2 d\theta/dt$. Details of the operation of the controller circuits were given, and the actual working results of this type of controller to a practical problem given, using a final electro-pneumatic regulator.

DISCUSSION

DR. A. L. WHITELEY (B.T.H.) said the authors had omitted two advantages of electronic control; it did not impose much load on the measuring system, and with the complex processes of the future it enabled correlation of the various automatic controllers composing the system.

PROFESSOR A. TUSTIN (Birmingham University) questioned whether the approach to the problem was on fundamentally the best lines. He saw no fundamental reason why the authors should have gone to such expense and trouble to obtain the derivatives and integrals in so accurate a form. The system seemed surprisingly complicated for the purpose in view.

MR. W. A. KEALEY (A.E.R.E.) thought the minimum integral action time of about two minutes a little slow for some control problems.

MR. J. R. HALSALL (I.C.I.) pointed out that in the existing pneumatic controllers the cost of adding derivative action might be about £10. In the authors' controller all that was entailed was the addition of two resistors and a capacitor at a cost of about 5s.

MR. A. J. YOUNG (I.C.I.), whose contribution was read, in his absence, by Mr. A. R. Aikman (I.C.I.), discussed the use of controllers in corrosive and inflammable atmospheres.

MR. A. R. AIKMAN (I.C.I.) said that while the system eliminated transmission lag between controller and valve, it did not eliminate the lag in the air-operated valve itself. In some cases, the valve lag was now the factor limiting the controllability of the process. It would also be useful if integral action could be eliminated at will.

MR. R. H. TIZARD (N.P.L.) urged that in the final publication the component values used in the equipment should be included in the circuit diagram.

MR. L. H. BAINBRIDGE-BELL (Admiralty) thought the circuit diagram might be clearer.

MR. G. H. ANDERSON (Imperial College) suggested that by keeping I_m independent of I_c one ran into difficulties. It would be an improvement if the proportional action were tied up with the desired value.

DR. G. L. D'OMBRAIN asked whether the authors thought they could develop the system to accept a direct electric signal. He also asked whether it would not be possible to dispense with contacts.

MR. S. A. BERGEN briefly replied.

THE WEEK

COMMERCE *in news* INDUSTRY

Standard Domestic Tariff

THE EAST Midlands Electricity Board has announced a new standard domestic tariff which is to come into force as from the first meter-reading after October 1 this year. The standard rate adopted is 4d. for each unit in the first block of units, which has been assessed on the basis of 30 units per quarter for three rooms or less, and 9 units per quarter for each additional room. A charge of ¾d. will be made for every unit in excess of this block. Small "rooms," such as halls, garages, larders, bathrooms and cloakrooms have been excluded from the assessment.

Coincidental with the introduction of these new prices, the Board has also decided to discontinue all charges for the hire of meters except when additional meters are installed at the consumer's request, and to abolish existing schemes whereby discounts are allowed for prompt payment. This standardisation applies solely to private dwellings and does not include any premises used both as a private home and for trade or business purposes.

The new rates will naturally have varying effects, but consumers at present supplied on a flat rate tariff should benefit, particularly those in the lower income groups using prepayment meters. For two-part tariff consumers, except where fixed charges are high, there will probably be a slight increase of the quarterly account. The Board does not anticipate gaining any additional revenue from the new charges.

New Company for Contracting

A NEW subsidiary company has been formed by Drake and Gorham Ltd. to deal exclusively with the firm's contracting business. The performance of all existing contracts and all future contracts entered into by the subsidiary will be guaranteed by the parent company and all shares will be owned by Drake and Gorham Ltd. This internal reorganisation will make no difference so far as customers, suppliers and associates are concerned. The subsidiary company will be known as Drake and Gorham (Contractors) Ltd.

E.D.A. Sales Management Conference

SOME 500 delegates are expected to attend E.D.A.'s Sales Management Conference to be held in London between May 22 and 25. Business on the first three days will be conducted at Caxton Hall, Westminster, but the concluding sessions and luncheon will be at the Connaught Rooms. On the first day Mr. H. T. Perry will talk on "Electricity and the Food Trade," and Mr. Philip Honey on "Co-operation with Allied Professional, Trade and Other Organisations." The final session on that day will be devoted to a programme of E.D.A. films. Lighting, Electricity in Agriculture, and Public Speaking will be the subjects covered on the second day, while on the Thursday the papers are entitled "More Mechanical Handling as an Aid to Greater Productivity," and "Radio Frequency Heating." The conference luncheon will be preceded by a general discussion on electrical topics. Mr. H. J. Randall will open proceedings on the Tuesday.

Y.E.B. Told to amend Safety Rules

A CORONER'S jury at Todmorden recently recommended that the Yorkshire Electricity Board should amend their safety rules following an accident which resulted in the electrocution of a linesman's mate on March 22. The deceased was said to have been repairing a low voltage overhead wire at Sourhall. The Board's general assistant engineer told the Halifax coroner that when he closed the switch on a high tension cable he had forgotten his instructions to the mate who was to repair a fault on a low voltage wire. The engineer was pre-occupied with the high tension pole. The jury returned a verdict of death by misadventure.

Water Heater Installation Work

UNDER a recent agreement between the E.T.U. and the Plumbers' Trades Union, concerning the installation, conversion and repair of electric

The First Half-Century

The success of the twopenny tube is almost equalled, some would say surpassed, by the West London Tramways, now for a week past open to the public. The cars, huge in size, vivid red in colour, beautifully lighted and swift in travel have started on their career of usefulness and profit. Though they followed one another at minute intervals there was on the opening day quite a struggle for places.

"I wish to make protest emphatic
Transformers can nohow be 'static'
Dynamic induction
Is all their production.
To call them such names is erratic."

—*From our issue of* 11 *April*, 1901.

water heaters, it has been decided that the fixing of domestic water heaters may be carried out by either an electrician or a plumber, with the proviso that the former shall deal only with the electrical side, and the latter handle the water-supply work. This proviso also applies to all water-heating jobs. In regard to the installation of immersion heaters, where the heater is separable from the immersion unit, such work is for the plumber, but where the heater is non-separable, both trades must work together. The positioning and fixing of large water-heating units is to be done jointly by both trades. There are to be no more plumber-electricians, for the operator must declare himself either a plumber or an electrician and take up the appropriate union membership. Plumber-electrician apprentices too, will complete their time and then take up either trade. This agreement is to apply in Great Britain and Northern Ireland, except an area of 10 miles radius from Aberdeen Town Hall.

Board's Festival Offer Criticised

THE S.E. Scotland Electricity Board's offer of the use of floodlighting equipment during the Festival of Britain met with bitter criticism at last week's meeting of the Area's Consultative Council. One member deplored the fact that the Board should make such an offer while people were being "bludgeoned and dragooned" into saving coal, electricity and gas. It was asking people to hire floodlighting equipment and yet shops were prevented from illuminating their windows, he said. The chairman, Mr. J. M. Airlie, reminded the Council that the restrictions on advertisement lighting also applied to floodlighting at present, but it was expected that a further order would be made approving it during the festival celebrations. Unless such an order was made there would be no floodlighting and the Board's offer would be irrelevant.

A complaint that workmen calling at private houses to carry out repairs or read the meter, neither wore a proper uniform nor carried credentials was also discussed at the meeting. It was suggested that workmen be issued with official badges. The complaint was passed on to the Board for investigation.

Sign-makers Protest

THE Electrical Sign Manufacturers' Association is protesting against the Chichester City Council's attitude towards neon advertising signs. The Council adopted a report at its February meeting prohibiting the use of these signs in a number of instances and the Association maintains that a local authority has no right to lay down rules as to what it will approve or disapprove.

The report which gave rise to the current protests, contains certain principles which would be borne in mind when applications for the erection of signs were considered. These principles are that there should be outright prohibition of signs above the facias of shops or above 15-ft. from the ground in the case of other buildings; that installations in which the tubes projected from the face of the building would be prohibited along with moving, flashing and pictorial signs; and that overhanging signs would be permitted only in exceptional circumstances. Broadly speaking, the report stated, the only installations which would be approved were those where neon tubes were fixed into box-type lettering which in turn was fixed about 2 in. from the facia, and those where tubes were fitted into grooves in the lettering on a facia.

This code of principles, states the Association, goes beyond the Control of Advertisements Regulations which provide that installations should be considered on their merits having regard only to the interests of amenity and public safety. The City Council has explained that they were not regulations or by-laws, but merely a guide in administering the regulations made by the Ministry. The idea was to give people a notion of what was likely to be approved under the planning regulations.

Shopwindow Lighting for Showroom

A MODIFIED form of shopwindow lighting has been adopted by Thorn Electrical Industries, Ltd., in the installation of new fittings at the Nuffield Organisation's Piccadilly showrooms. Main problem of the scheme was to provide uniform illumination over the extensive area of the showroom with sufficient intensity to eliminate window reflections during the daytime, yet at the same time,

Modified shopwindow lighting used to good effect in the Nuffield Organisation's Piccadilly showrooms. Uniform lighting throughout has ensured that daylight and window reflections do not distract the attention of passers-by from the vehicles on show

to avoid glare. Units used were Atlas FHQ.2080 reflector fittings with detachable louvre frames. Each reflector contains two 5-ft 80-W fluorescent lamps and three continuous rows of these units run the length of the showroom. Colour rendering is also effective with the inclusion of one warm white and one northlight lamp in each reflector. The total lighting load is about 4·6 kW, but it is interesting to note that had the same lumen output been achieved with incandescent lighting, some 50 200-W lamps would have been necessary. Contractors were the St. James Electrical Co., Ltd.

Control Gear Economy

LONDON Transport is experimenting on the Piccadilly line with a train in which the guard is positioned in the centre instead of at the rear. The object is to see if any economy can be effected by having one set of control gears instead of two which at present are situated at each end of underground trains. The main difficulty is to find a suitable system which will ensure that automatic doors can be controlled safely, preventing doors which are not opposite the platform from being opened. For this purpose an area has been marked off on the platform and if the guard stops within this area the whole train is within the bounds of the platform. If the centre of the train stops short or beyond these marks however, the guard is able to cut out doors at the extreme rear or front of the train. All existing rolling stock has been fitted with duplicate control gear, so that the proposed economy will be effective only when new stock is put in service.

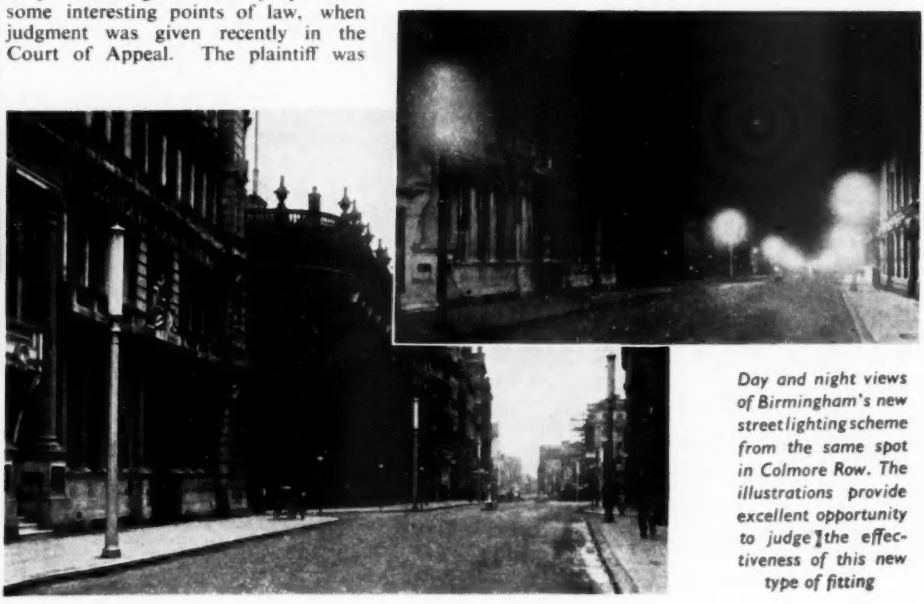
Accident when Repairing a Fan

AN accident which occurred in the maintenance shop of a margarine factory, provided some interesting points of law, when judgment was given recently in the Court of Appeal. The plaintiff was an electrician, employed at the factory, who was testing a fan used to extract steam in a ventilator. The fan, with its cover off, had been removed to the maintenance shop for repair and the plaintiff inadvertently caught his hand in the rotating blades, suffering injury. The defence argued that the fan was being repaired in a separate factory, and was not part of the machinery of that factory. But it was held that the testing of machinery was a process for, and incidental to the main purpose of the factory and therefore the maintenance shop was to be deemed to be part of the factory. Therefore the plaintiff was entitled to recover damages under Section 14(1) of the Factories Act.

New Lanterns used in Birmingham

A FEATURE of the street lighting scheme recently inaugurated in Birmingham's city centre is the large-scale employment of the comparatively new vertical and cylindrical lanterns. There are to date few lighting schemes incorporating this type of lantern, but the proposed installation throughout the large city centre will no doubt set the pace for the wider adoption of these fittings. Few will deny that the fittings besides providing effective illumination at night also give an elegant and tidy appearance by day.

Each of the lanterns accommodates four 5 ft 80 W fluorescent lamps and comprises a cast aluminium head and base separated by an opal perspex cylinder. The fluted columns are of cast iron. All the equipment was manufactured by Revo Electric Co. Ltd. Design of the columns and lanterns was by Mr. D. H. Davies, city architect, and the installation was carried out by the Public Lighting Department.



Day and night views of Birmingham's new street lighting scheme from the same spot in Colmore Row. The illustrations provide excellent opportunity to judge the effectiveness of this new type of fitting

Large car sections are stoved in about 15 minutes in this paint stoving plant built by Morris Commercial Cars Ltd. The plant incorporates ten Metropolitan-Vickers' 4 kW infra-red element projectors, but by means of a temperature control panel this load can be reduced to suit production requirements. Although the time taken is longer than usual it suits production and enables parts of all sizes to be put through

Metering CO_2

AN account of the use and operation of electrical instruments for gas analysis in cold storage and in power stations is given by D. W. Foster and W. E. M. Arundel in a paper entitled "Gas Analysis Equipment with particular reference to Carbon Dioxide Measurement" which was read by Mr. Arundel to the London Students' Section of the I.E.E. last Monday.

An important type of gas analysis meter depends for its operation on the differences between the thermal conductivity for various gases, that of carbon dioxide being only 59% that of air. Two arms of a Wheatstone bridge circuit are surrounded respectively by a standard specimen of air and a sample of the gas under test. Such a meter, regularly checked against the Orsat chemical apparatus could be relied upon to ±0·5%, but the accuracy of the final result is limited by the accuracy of sampling.

The measurement of carbon dioxide content is important to ensure that economic combustion takes place in a furnace and also in the storage of food where an atmosphere of carbon dioxide retards the rate of bacterial growth.

A.E.M.T. Convention at Llandudno

THE Association of Electrical Machinery Trades has announced the programme of its Convention to take place on May 1 and 2 at the Imperial Hotel, Llandudno. The two papers, which will be read on the second day, are "The Practical Application of Roller Bearings to Electrical Machines," by Mr. R. K. Allan, of Skefko, and "Winding Wires," by A. G. Sweetland, of B.I.C.C. The Council Meeting will be held during the afternoon of the first day and the dinner will be followed by a smoking concert.

Television goes Underground

DELEGATES to the conference of International Consultative Committee on Telecommunications saw a special demonstration of television signals transmitted over coaxial cables when they visited the B.B.C.'s transmission station at Sutton Coldfield recently. This cable, manufactured and laid by Standard Telephones and Cables Ltd., follows a 200-mile route from London, through Birmingham to Stoke, and back to Birmingham. The main cable—the whole is in three sections—forms part of the G.P.O. trunk telephone network terminating at Museum Exchange in London and Telephone House, Birmingham. End connections have been provided by tail cables to Alexandra Palace and Sutton Coldfield.

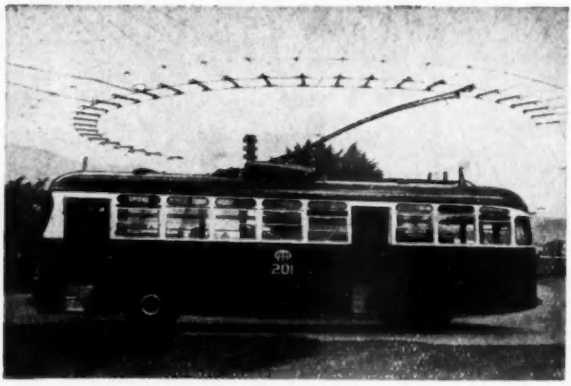
The London-Birmingham section incorporates two 0·975 in. and four 0·375 in. coaxial tubes. The large tubes are used for two-way transmissions of 405-line television signals requiring a vides bandwidth of about 3 Mc/s. Ultimately they may be required for very high definition or colour television and frequencies up to 26 Mc/s may be involved. The 0·375 in. tubes are used for broad-band telephony purposes and on the Birmingham-Stoke cable these are used for 405-line television transmissions with repeater stations six miles apart as opposed to 12-mile spacing with the larger tubes.

Hullo There!

ANY celebration of the G.P.O.'s achievements has been overshadowed by the recent increases in the telephone, telegraph and parcel rates, but March 31 marked the sixtieth anniversary of the first telephone calls between this country and the Continent. The following day the service was opened to the public and to mark the occasion leading members of the Stock Exchange were invited to use the service free of charge. After 60 years there are now 300 circuits to 45 European towns, serving every country except Albania and each day nearly 10,000 calls are exchanged between the U.K. and the Continent.

B.V.C. Jubilee Display

TO mark the occasion of their fiftieth anniversary the British Vacuum Cleaner and Engineering Co., Ltd. have arranged a display of historic and contemporary vacuum cleaning appliances. Prominent in the display are hand-operated vacuum cleaners introduced at the beginning of the century, the first electrically-operated domestic models of 1910 and a large electric plant mounted in a trolley cart which has given half a century of efficient service with the Royal Naval College, originally at Osborne, I.O.W.



One of the new single-decker trolleybuses supplied to Hobart Municipal Tramways and containing G.E.C. electrical equipment. Note the larger but by no means inelegant roof box designed to house a number of necessary components

British Trolleybuses for Hobart

CONTINUING an association which began in 1934 with the Hobart Municipal Tramways, the G.E.C. have recently supplied electrical equipment for a further 36 trolleybuses delivered by the British United Traction Ltd. The Hobart fleet now numbers some 63 vehicles. In the latest order the motors are rated at 100 h.p. and are a compound-wound type in which the windings are arranged so as to introduce a safe rheostatic brake and no regeneration. The motors are self-ventilated and an air filter has been included comprising a turbulence type of filter and dust-settling tank. A generator mounted on one end of the motor frame provides a low-voltage supply for charging the battery and for lighting.

These latest buses have also been equipped with a roof box which has been designed to contain the connection between the trolleys and the body wiring, certain wireless interference suppression components and lightning arresters. The accumulation of all these components in one case has given a tidier roof layout as well as reduced the liability to failure of connections and eased maintenance.

NEWS IN BRIEF

The Board of Trade has informed us that their announcement concerning the maximum price of weak sulphuric acid should have read 27s. 6d. and not 26s. 6d. (see page 585 of last week's issue).

The Council of Industrial Design has compiled lists of consumer goods exhibits to be shown at the South Bank site of the Festival of Britain. Lists available at present include one on "Electrical, Gas, Solid Fuel and Oil Domestic Equipment." Among those which will be ready by April 20 are "Domestic Lighting Fittings" and "Domestic Radio, Television and Gramophone." Each list costs 1s. 3d.

An order for 18 12,500 kVA 66/33/7·6 kV transformers has recently been delivered at Adelaide for the Electricity Trust of South Australia by English Electric. A further order has since been received for ten additional transformers of identical design.

The E.C.A. has decided to sponsor a mission of experts from O.E.E.C. countries to the World Metallurgical Congress at Detroit provided sufficient support is forthcoming. Information can be obtained from British Engineers' Association, 32 Victoria Street, S.W.1.

Questions in Parliament

Price Controls

Asked about price control, Mr. Wilson said the Central Price Regulation Committee had now reviewed most of the price controls over consumer goods (other than food) which had been removed since 1945. The committee had reported that, in general, price increases since decontrol had not been excessive having regard to rises in raw material prices and other costs. In the case of certain classes of goods which were the subject of a more detailed statement, they suggest that it will be necessary in the near future to introduce price control either on a statutory or on a voluntary basis. He was now taking steps to give effect to their recommendations. The classes of goods in respect of which it is recommended that price control should be introduced includes domestic hollow-ware made of aluminium, copper, brass, plated and stainless steel; hardware and ironmongery. For radio valves, the Committee consider that an undertaking should be secured from the manufacturers concerned not to advance prices without prior consultation with the committee. In the case of domestic cooking, refrigerating, heating, cleaning, and washing appliances, the committee had decided to open discussions with the industries concerned in order to work out with them a suitable form of price control which could be put into operation without delay should the need arise.

Electric Supply News

Bristol

For the purpose of erecting another generating station at Portishead adjoining the existing station, the B.E.A. is arranging to purchase 7½ acres of land for the sum of £190,000. On the land are several old buildings which will be demolished.

Malvern

The Malvern U.D.C. had no particular quarrel with the proposed revised route for a power line across the Hills, but it did want the line to go underground, declared Mr. J. Bulman, clerk to the council, at the second inquiry into the Midland Electricity Board's scheme, opened last week. He said the existing line which crossed the Hills was placed there years ago—he understood there had never been a fault—and the council felt justified in asking that the new main should go underground. He pointed out that the U.D.C., with rural parishes adjoining, many years ago obtained Acts of Parliament saddling themselves with heavy future expenditure for the protection of the Hills. For the Board, Mr. J. F. Bowte stated that the cost of the present proposal, using wood poles, would be £8,500 as against £33,700 for an underground scheme. Demand and consumption had increased sevenfold since 1931. Mr. G. F. Peirson, the board's chief engineer, too, pointed out that 838 farms in Herefordshire were now supplied—117 having been connected in the last 12 months. The inquiry was adjourned.

Poole

The Town Council has appealed to the Ministry of Fuel and Power asking that the Southern Electricity Board should place new h.t. mains underground when crossing two main roads—one of them the Poole-Ringwood road—instead of overhead. Apparently the Board plan to erect the lines between two existing distribution lines from the grid. That arrangement prevented further encroachment on building land, it was explained at the recent meeting of the Electricity Consultative Council, who, while not supporting the T.C. agreed to urge the Board to place the wires so that they did not appear below the present sets.

Stourport

More small teething troubles have caused Stourport "B" to be out of operation again, but it is expected that the station will be working again within a fortnight.

Ulverston

For some time past the local council has been making efforts to obtain the reintroduction of an electricity account collecting system, but so far without success. The North Western Electricity Board has been asked to adopt the system of collecting electricity accounts for council houses by monthly instalment through the rents, but the Electricity Consultative Council has pointed out that such a scheme would lead to additional costs by extra internal accountancy. Also that system had previously been operative in Barrow and Kendal, and if reintroduced in Ulverston, those areas might press for its restoration as well.

York

The British Electricity Authority had denied liability for the loss of Corporation property as the result of an explosion at York power station in 1949, it was reported at the recent Council meeting. It was decided to authorise the town clerk to instruct counsel and to take proceedings in respect of a £14,500 claim for damages as the result of the explosion. Councillor A. S. Rymer, chairman of the Streets and Buildings Committee, explained that when the boiler exploded at the electricity works in 1949 substantial damage was done to Corporation property behind the generating station. An assessor had been engaged and the claim had been put in for the damage. Some buildings had been demolished completely, and the roofs of others had been blown off. The destructor had been put out of action, and there was now no destructor in York.

LIGHTING SCHEMES

Birkenhead.—Because the Minister of Transport is of the view that a new system of fluorescent lighting at Woodside Ferry Approach, and the conversion to fluorescent lighting in Grange Road West, Oxton Road and Charing Cross cannot be justified at the present time, a sum of £4,300 in grant has been withheld from the Corporation for new lighting. The Divisional road engineer is to visit the areas.

Blackpool.—The Highway Committee has approved schemes for improving, and converting from gas to electricity (where necessary), the lighting in various streets at a total cost of £36,000.

Falkirk.—The scheme for the expenditure of £38,180 over a period of seven years for converting the existing gas street lighting to electricity has been turned down by the M.o.T., who intimated that an application would be considered on a year-to-year basis on a seven-year programme, with expenditure limited to £6,000 annually. This the Lighting Committee proposes to do, and has instructed the burgh engineer accordingly.

Grimsby.—The Highways Committee has approved a scheme for lighting on Gilbey Road to the borough boundary, at a cost of £1,100.

Middlesbrough.—T.C. has applied for sanction to borrow £1,180 for the erection of street lamps at Holmwood and Glendale.

Ormskirk.—The M.o.T. has authorised the provision of 19 sodium-vapour lamps in Stanley Street, Railway Road, Derby Street and Derby Street West, at a cost of £830.

Radcliffe.—T.C. has approved lighting schemes for Ainsworth Road, Spring Lane and Cross Lane, at a total cost of £3,380.

Spalding.—The U.D.C. has received M.o.T. sanction to a scheme for lighting the trunk road with 80 W fluorescent and 140 W sodium lamps.

Company Activities

Aberdare Cables Ltd.

Group trading profit for the year to October 31 last is £258,896 as against £355,453. Deducting depreciation, etc., of £37,613 (*£55,109*) leaves a balance of £221,283 (*£300,344*). Adding dividends and required provision, £32,739 (*£4,050*), makes the total £254,022 (*£304,394*). To taxation £144,958 (*£157,025*), outside interests and retained by subsidiaries £11,090, leaving a net profit attributable to holding company £97,974 (*£139,742*). The dividends of 20% absorb £54,308 (*same*), leaving £185,849 carried forward by the present company. Consolidated balance carried forward is £194,656 (*£144,858*).

Associated Electrical Industries

At this meeting, Mr. Oliver Lyttelton, chairman, referred to the applications made to the Capital Investment Committee. The Board has recommended the conversion and issue of Preference stock, proposing to reduce the 8% Preference to 4½%, and to issue to present Preference holders 330,760 new 4½% £1 Preference at par. Preference holders will also have the right to subscribe for 800,772 £1 Ordinary shares at par in the ratio of three for ten. He stated that the directors had abandoned their proposal to give employees an opportunity to subscribe for 699,228 Ordinary shares at £2 each, because the Inland Revenue had intimated that the difference between the issue price and the market price would have been subject to tax. Other methods of offering employees a participation in the business will be examined.

Brazilian Traction Light and Power Co.

An interim statement shows the combined gross earnings from operation in 1950, as $133,998,466, as against $123,884,473 in the previous year. After deducting operating expenses, depreciation amortisation and other charges totalling $100,776,465 ($*92,125,670*), there remains an estimated net revenue of $33,222,001 as compared with $31,758,803 in 1949.

British Engine Boiler and Electrical Insurance Co.

For 1950, premium income, etc., amounted to £1,717,985 (*£1,584,456*), with claims and other outgoings totalling £1,460,391 (*£1,374,547*). After providing for unexpired risks, the profit is £204,182 (*£148,684*).

British Industrial Plastics, Ltd.

Additional capital would be needed in the near future, and an estimate of total requirements was being prepared, shareholders were told at this meeting last week by Mr. K. M. Chance, chairman. He considered their case a strong one for coupling an issue of bonus shares with an issue of new shares for cash, and as soon as the directors had approved the amount of additional cash required he would approach the Capital Issues Committee, and he hoped to be able to put forward a scheme which would meet with their approval and that of the shareholders.

Brook Motors, Ltd.

Dealings began on Monday in shares in this old family business which has been converted into a public company. The issued capital consists of 197,643 5% redeemable preference shares of £1 each, and 856,022 Ordinary 10s. shares. Market quotation for the Ordinary was 34s. 6d.-35s. 3d., and the Preference were a nominal market around par.

Cambridge Instrument Co., Ltd.

For 1950, the profit amounted to £466,962 as against £408,461 for 1949. Depreciation takes £29,396 (*£6,506*), taxation £193,405 (*£146,464*), general reserve £34,942 (*£90,000*), dividend equalisation reserve £25,000 (*£15,000*), building and plant reserve £20,000 (*£40,000*), and pensions £5,000 (*nil*). Ordinary tax-free distributions on the enlarged capital absorbs £102,180 (*£57,477*), leaving £45,049 (*£38,543*) carried forward.

Senior Economisers, Ltd.

For 1950, profit, etc., is £132,531, as compared with £106,368 for the previous year. Taxation absorbs £68,228 (*£55,195*), depreciation £6,757 (*£5,440*), fees £8,479 (*£7,625*), pensions £1,545 (*£1,471*), leaving a net profit of £47,522 (*£36,002*), to which is added tax over-provision of £3,365 (*£11,218*). The final Ordinary dividend is 30% making 60% (*same, but 1949 interim was on smaller capital*). To general reserve £20,000 (*£18,425*), and there is £19,257 (*£11,470*) carried forward.

Telegraph Condenser Co., Ltd.

Trading profits for 1950 were £329,942 as against £163,022 in 1949. There is a final ordinary dividend of 15% (*10%*) making 20% (*15%*). In addition it is proposed to raise the capital from £280,000 to £580,000 by creating 600,000 new ordinary 10s. shares and to capitalise £50,000 of general reserve in distributing new ordinary shares as a scrip bonus on a one-for-three basis. The new ordinary will not rank for the final dividend. In the 1950 results, taxation absorbs £147,793 (*£67,812*), and there is £120,000 (*£50,000*) transferred to general reserve, leaving £49,363 (*£48,265*) carried forward.

Dividends Declared

Davis and Timmins Ltd. Final ordinary dividend of 15%

Parmiter, Hope and Sugden Ltd. Interim dividend of 7½%.

J. and F. Stone Lighting and Radio Ltd. Interim dividend of 10% (*same*), payable on April 27.

G. and J. Weir Ltd. Final dividend of 35% (*30%*) making 45% (*40%*).

Commercial Information

CONTRACTS OPEN

HOME

April 13.—Golborne U.D.C. Supply and erection of Group A sodium lighting along approx. ¼ mile of the Liverpool-East Lancs. Rd. (A580) at Lowton. J. B. Hoyle, Engineer and Surveyor, Council Offices, Lowton, Nr. Warrington.

April 14.—Bideford T.C. Supply and erection of columns and lanterns for 41-point 250 W mercury vapour lighting in Group A on trunk road A41. Borough Surveyor's Office, Town Hall. Deposit £2 2s.

April 14.—Felling U.D.C. Installation of wiring, fittings and components in 6 shops and flats on Nest House, High Lane and Wardley estates. Chief Housing Officer, Council Buildings.

April 14.—S. Armagh. Hospital Management Committee invite quotations for portable electric shadowless lamp, insulated food carrier, electric floor polisher, and electric mixer. Secretary, Armagh City Hospital.

April 16.—Saltcoats. Lighting of trunk road A78 within burgh by mercury discharge lamps. Burgh Surveyor's Office, Kyleshill, Saltcoats.

April 16.—West Hartlepool T.C. Electrical installation in Rift House county primary school. Borough Architect, Municipal Buildings.

April 17.—Birmingham. Supply on hire, installation and full maintenance, operation and dismantling of amplifying equipment in various parks during the summer. General Manager, Parks Dept., Civic Centre, Birmingham 1.

April 17.—N. of Scotland H.E. Board. Installation of new equipment and conversion of existing equipment (mainly radio) in premises affected by changeover from d.c. to a.c. in Perth City Area. Tenders may be submitted for either radio or electrical appliances or both. Documents from engineers, Kennedy and Donkin, 1 Charlotte St., Perth. Deposit £1 1s.

April 19.—Altrincham T.C. Supply and installation of complete public address system in Stamford Hall. Documents from the Manager, Stamford Hall, Altrincham.

April 19.—Manchester. Electrical installation at Newall Green secondary school. City Architect, Town Hall. Deposit £1 1s. (See March 22 issue).

April 21.—Dundee. Electric lighting installations in erection of 368 houses at Douglas and Angus housing scheme. City Quantity Surveyor, 21 City Sq.

April 23.—Arnold (Notts) U.D.C. Supply and erection of 89 140 W sodium lamps on concrete columns along Mansfield Rd. (A.60). Engineer and Surveyor, Council Offices, Arnot Hill Park. Deposit £2 2s.

April 23.—Birmingham. Supply and erection of 8 electric lifts at Duddeston and Nechells flats. Herbert J. Manzoni, City Engineer and Surveyor, Civic Centre, Birmingham 1. Deposit £2 2s.

April 23.—Musselburgh T.C. Electrical work in erection of 24 houses. Burgh Surveyor, Municipal Offices, High St.

April 23.—Southgate T.C. Supply and erection of electrically operated petrol pump with clock-type indicator. J. T. W. Peat, Borough Engineer and Surveyor, Town Hall, Palmers Green, N.13.

April 24.—Bangor (Co Down) T.C. Electrical installation in small buildings at Marine Gardens. Borough Surveyor's Office Town Hall.

April 24.—Wortley R.D.C. Installation of wiring and fittings in 65 houses—first instalment of a scheme involving 1,300 houses. Surveyor to the Council, Council Offices, Grenoside, Sheffield. Deposit £2 2s. (See March 29 issue.)

April 24.—N. Ireland. Electrical installation in 39 houses at Kells and 24 houses at Sunningdale for N.I. Housing Trust. Offices of the Trust are at 12 Hope St., Belfast. Deposit 10s. each.

April 25.—Bath. Electrical installation comprising lighting and power at 13-14 Somerset Place. Consulting Engineer, A. N. Irens, Haycroft House, Filton, Bristol. Deposit £3.3s.

April 26.—Warrington T.C. Rewiring of electrical installation at public baths. Borough Surveyor, Town Hall.

April 27.—Belfast. Supply and installation of 33 kV and 6.6 kV cables and accessories for City Electricity Dept. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne 1. Deposit £5 5s. (See April 5 issue.)

April 27.—Belfast. Supply of street lighting remote control equipments and control switches. Electricity Dept., E. Bridge St., Belfast. Deposit £1 1s. (Advertised in this issue.)

April 30.—N. Ireland. Electrical installation and wiring for radio distribution at Erne Hospital, Enniskillen. Documents from J. R. W. Murland, consulting engineer, 13 Wellington Place, Belfast. Deposit £3 3s.

April 30.—Romford T.C. Electrical installation in 100 two-storey flats and 14 houses on Cross Roads estate. Borough Engineer and Surveyor, Town Hall. Deposit £2 2s.

May 1.—Barrowford (Lancs). U.D.C. Electrical work in 12 houses on Higher Causeway estate. Engineer and Surveyor, Council Offices. Deposit £1 1s.

May 1.—Spalding (Lincs.) U.D.C. Supply and erection of 61 140 W sodium vapour and 23 3 ft 80 W fluorescent lamps along trunk road A16. Also of 21 3 ft 80 W fluorescent lamps on other roads in town. Raymond W. Hastings, Clerk to the Council, 11 Market Place, Spalding. (See April 5 issue.)

May 25.—Belfast. Supply and erection of 33 kV 1,500 MVA open type indoor switchgear of the airblast or small oil volume type. Merz and McLellan, Carliol House, Newcastle-on-Tyne 1. Deposit £5 5s. (Advertised in this issue.)

No date stated.—Bridge of Allan. Electrical work in 23 dwellings on Blackdub site and at Stanley Drive. Wilson and Wilson, architects, 39 Vicar St., Falkirk.

No date stated.—Midlothian. Electrical work in 8 houses at West Calder. County Architect. 32 Palmerston Place, Edinburgh 12.

No date stated.—Newcastle-on-Tyne. Electrical installations in 347 dwellings and 20 shops on various estates. Applications to City Architect, 18 Cloth Market, Newcastle-on-Tyne.

No date stated.—N. of Scotland H.E.Bd.—Supply and erection of 13 miles of 33 kV and 5 miles of 11 kV and lower voltage s.c. wood pole o.h. lines in Alexandria-Drymen-Kepculloch area. Apply to Merz and McLellan, 39 Northumberland Street, Edinburgh. Deposit £1 1s. (See March 29 issue.)

No date stated.—N. of Scotland H.E.Board. Supply and erection of approx. 20 miles 33 kV overhead transmission line between Balthayock and Blairgowrie in Perthshire. Applications by April 20 to Kennedy and Donkin, 12 Caxton St., London S.W.1. Deposit £1 1s. (Advertised in this issue.)

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

April 25.—Belgium. Two lots of expanding micro-telephonic cable connections. Direction du Materiel et des Achats, Bureau 26-51 Section 9, 17 rue de Louvain, Brussels.

April 26.—New Zealand. Tenders invited for 19,400 high stability carbon resistors and 2,000 condensors by Director-General, Stores Division, G.P.O., Wellington C.1. B.o.T. (Ref. CRE (IB) 57623/51)*

April 30.—Uruguay. Tenders invited for 19 commutators and 250 keys of insulated head type for Direccion General de Comunicacions (Servicio de Transmissiones). B.o.T. (Ref. CRE(IB) 55955/51).*

May 7.—Thailand. Supply and erection of complete diesel-electric power plant of 3 x500 kW capacity, suitable for 3,500 V, for Port of Bangkok. Dept. of Transport, Ministry of Communications, Bangkok. Deposit 10,000 Baht. B.o.T. (Ref. CRE (IB) 57571/51)*.

May 16—Uruguay. Usinas Electricas y Telefonos del Estado invite tenders for 10 Diesel generating sets of approx. 50kW each. B.o.T. (Ref. CRE (1B) 57452/51).*

May 16.—Greece. Various telecommunications equipment and materials under Greek Reconstruction Programme, for Ministry of Communications, Argentine Str 4, Athens. Details can be obtained from Telecommunications Organisation for Greece, 15 Churchill St., Athens. B.o.T. (Ref. CRE (IB) 51576/51)*.

May 31.—Sydney. Manufacture and supply of 11 kV eight-panel duplicate busbar metal-clad compound filled switchboard with triple-pole, 250 MVA solenoid operated oil circuit-breaker with accessories, for County Council. B.o.T. (Ref. CRE (IB) 57207/51).*

June 13.—Queensland. Supply, erection and testing of six 66 kV circuit-breakers at Townsville Regional Electricity Board's power station and sub-stations at Townsville, Ayr and Home Hill, for State Electricity Commission. B.o.T. (Ref. CRE (IB) 56696/51).*

CONTRACTS PLACED

B.E.A. Auxiliary switchgear and accessories, A. Reyrolle and Co. Ltd., and coal handling plant, Mitchell Engineering Ltd., for Drakelow power station; coal handling plant at Fleetwood power station, Simon Carves Ltd; one 30,000 kW turbo-alternator, condensing and feed heating plant for Warrington power station, Brush Electrical Engineering Co. Ltd.; one 50,000 kW turbo-alternator for Braehead power station, C. A. Parsons and Co. Ltd.; and 132 kV overhead lines between Carmarthen Bay and Carmarthen-Haverford West, British Insulated Callender's Construction Co. Ltd.

Salford. Installation of lift at Hope Hospital for Manchester Regional Hospital Board, Wm. Gornall and Sons Ltd., £2,800.

Coventry. Electrical installation, in flats on Fletchampstead Highway estate, The Thompson Electrical Co., £2,166.

Torquay T.C. Electrical installation in 144 houses on Marldon Rd. estate, Havill and Williams, £5,950.

Warwick. Supply of electrical large-capacity rectifying equipment for Central Hospital, Hatton, for Birmingham Regional Hospital Board, Electrical Construction Co., Ltd., £1,665.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Guidemaster. 695,940. Class 11. Electric torches and lamps for motor vehicles. Notek Electric Co. Ltd., 23 London Rd., Bromley, Kent.

Lan-Elec. 676,302. Class 7. Electric machines. Lan-Elec Ltd., 220-221 Bedford Ave., Slough Trading Estate.

Sandby. 694,788. Class 7. Machines and machine tools, all electrically operated; and electric motors. 694,789. Class 9. Electrical apparatus. Class 11. All goods. Smart and Brown (Engineers) Ltd., Electrical Works, Trading Estate, Spennymoor, Co. Durham.

Your Queries — Answered

"Reax" irons, makers of? L.B.—Essential Electrical Equipment Ltd., 78 Victoria Rd., Surbiton. (19836)

"Trehawk" torches, makers of? T.E.—Hawk Ltd., Treforest Trading Estate, Pontypridd, Glam. (19883)

"Dagenite" batteries, makers of? M.F.—Peto and Radford, 50 Grosvenor Gdns., S.W.1. (19857)

"Newbridge" gas lighters, makers of? B.B.—Horstmann Gear Co. Ltd., Newbridge Works, Bath. (19863)

"Argosy" pumps, makers of? H.D.—F. W. Brackett and Co. Ltd., Hythe Station Rd., Colchester. (19874)

"Cycloc" battery charging equipment, makers of? W.S.—Harmer and Simmons Ltd., 1 Arkley Rd., Walthamstow, E.17. (19849)

"Palatine" cleaners, suppliers of? B.C.—Downes and Davies Ltd., 1/9 Stanley St., Liverpool 1. (19896)

De-horner for cattle, makers of? N.D.—Cooper-Stewart Eng. Co. Ltd., Avenue Chambers, Vernon Place, London W.C.1. (19908)

The above are selected from questions we have answered this week. If you have a query, send it to us.

Storrall. 689,693. **Storreel.** 689,694. Class 9. Magnetic tape sound recording and sound reproducing apparatus. Storr Supplies Ltd., 3 Balham Rd., Edmonton N.9.

Sherwen. 678,760. Class 7. Electro-magnetic vibrators, etc. General Electric Co. Ltd., Magnet House, Kingsway, W.C.2.

Teledim. B691,814. Class 9. Electric choke coils for use in television. A. E. Sommers and Co. Ltd., 96A Sydenham Rd., S.E.16.

Telecel. 692,076. Class 9. Electric accumulators. Alkaline Batteries Ltd., Union St., Redditch, Worcs.

Volex. 692,411. Class 9. Electric switches, insulated wire and cables. Ward and Goldstone Ltd., Sampson Works, Frederick Rd., Pendleton, Manchester 6.

TRADE NOTES

New Telegraphic Address. The new telegraphic address of the Helsby Works of British Insulated Callender's Cables Ltd. is: "Bicalbest, Helsby, Warrington."

Indian Imports. Under the latest Indian regulations, for the period to December 1951, licences for the importation of rubber insulated cables have been doubled in value. Licences for many other goods, too, have been doubled, exceptions being for motors, generators, control gear, transmission gear, table fans, and batteries.

Changes of Address. Mr. E. R. Rogers, the Northern representative for electrical products of the Westinghouse Brake and Signal Co. Ltd., has removed to 26 Park Rd., Timperley, Altrincham, Cheshire. Tel. Sale 3583.

The London office of Premier Electric Heaters Ltd., under the managership of Mr. S. E. Whorton, has moved to Crown House, Aldwych, W.C.2. Tel. Temple Bar 7639.

B.E.A.M.A. Newly elected members of B.E.A.M.A. are Fibreglass Ltd. (Insulations Section), and Thermovent Heating (E. K. Cole Ltd.) (Domestic Electrical Appliances Section).

Production. Ranco Ltd., are expected to start production of temperature controls and similar electrical instruments at Newhouse Industrial Estate, Lanarkshire, in the next few weeks. The firm is a subsidiary of Ranco Inc., of Ohio, U.S.A.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d	New York price
COPPER, electrolytic	210 0 0	£196 0 0
Delivered in 2nd and 3rd month after order ...	213 10 0	—
Delivered in 4th, 5th and 6th month after order	225 0 0	—
LEAD, good soft pig (foreign)	160 0 0	136 0 0
" " " "English" quality	161 10 0	
Delivered in 2nd and 3rd month after order, plus	7 0 0	
TIN (99-99.75%) ... ...(Cash)	1300-1310	—
" (3 months)	1240-1245	—
ALUMINIUM, commercial purity (del.) ...	124 0 0	—
ZINC	160 0 0	140 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.)	47 10 0	—
Mild Steel Tape (0.04 in.)	26 10 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Bernard's Supplyit Ltd. Laurence Wm. Hellard, 51 Kneller Rd., Twickenham, Middlx., has been appointed liquidator. Meeting of members and creditors will take place at 29 Nelson Rd., Whitton, Middx., on May 10 at 12 noon and 12.30 p.m. resp., to receive liquidator's report.

Blaenau Electrical Supplies Ltd. Resolution for voluntary winding-up passed at meeting on March 16. Alexander Petrie Whyte, C.A., Electricity House, Love Lane, Liverpool 3, appointed liquidator.

Brook Motors Ltd. Resolution passed for voluntary winding-up in order to carry out reconstruction of the company, at a meeting on Mar. 30. Harold Lawson Simpson, C.A., Bank Chambers, Market St., Huddersfield, appointed liquidator.

Underwood Electric Co. Ltd. Meeting of creditors to be held at Winchester House, Old Broad St., E.C.2, on April 17 at 12 noon.

Delhi Electric Supply and Traction Co. Ltd. Creditors are asked to send full particulars to Albert W. R. Lovering and Samuel H. Taylor, at Suffolk House, Laurence Poultney Hill, E.C.4, the liquidators, by April 30.

Edgworth Electrics Ltd. Meeting of creditors will take place at 98 London Rd., St. Albans, Herts, on April 19 at 3 p.m.

Electrical Power Installations (South Wales) Ltd. Meetings of members and creditors at offices of Poppleton and Appleby, C.As., 35 Windsor Place, Cardiff, on April 11 at 12 noon and 12.30 p.m. resp.

Lauray Electrical Co. Ltd. Meeting of creditors to be held at offices of Shindler and Co., 23-25 Eastcheap, E.C.3, on April 26 at 3 p.m.

Intended Dividend

London. Ward Electrical Engineering Co. Ltd., Wardour St., W.1. Last day for receiving proofs, April 21. Liquidator is Albert E. Attwood, 20-21 Lawrence Lane, Cheapside, E.C.2.

Stafford. Sydney William Morley, radio and electrical engineer, trading as "Morleys" at Bow St., Rugeley. Last day for receiving proofs, April 13. Trustee P. J. Snow, 17 Albion St., Hanley, Stoke-on-Trent.

Parnership Dissolved

Brighton. F. W. G. Tingley and L. C. Surman, trading as "Tingleys," electrical contractors and radio engineers, at 57 Lewes Rd., Brighton. Partnership dissolved as from March 31. All debts will be received and paid by L. C. Surman.

Voluntary Liquidation

C.V.P. Electrical Ltd., Ryde, I. o. W. At meeting of creditors statement of affairs was presented showing liabilities amounting to £964 3s. 10s., against assets of £267 6s., thus leaving a deficiency of £696 17s. 10d. Company was incorporated in April, 1946, with a capital of £100, and the accounts for the first year showed net loss of £20. During succeeding years there were net losses of £25, £68 and £355 respectively. Resolution was passed confirming voluntary liquidation. Mr. H. C. Allen, of 211, Lower Addiscombe Rd., Croydon, was appointed liquidator, with a committee of inspection.

BANKRUPTCY ACTS

Dividends

Blackburn. Herbert Harvey Baron, electrician of 84 Duckworth St., Darwen. Supplemental dividend of 11½d. in £ payable on April 13 at Official Receiver's Office, 20 Byron St., Manchester 3.

BUSINESS PROSPECTS

HOME

Alsager (Staffs) U.D.C. Erection of 70 houses on Close Lane site. Engineer and Surveyor, G. F. Taylor, Council Offices, 3 Lawton Rd., Alsager, Stoke.

Basingstoke T.C. Erection of 30 dwellings on South Ham site. Borough Surveyor, Municipal Buildings.

Belfast. Erection of 202 flats in 34 blocks on Annadale Embankment estate. Housing Architect's Dept., 94 Chichester St., Belfast.

Berkshire. Erection of new primary school in Blenheim Rd., Maidenhead. County Architect, Wilton House, Parkside Rd., Reading.

Berwick T.C. Council is to build 31 houses at Spittal and 32 at Tweedmouth. County Architect is W. W. Tasker, County Hall, Newcastle-on-Tyne.

Bolton T.C. Erection of 52 flats and houses at Breightmet. Housing Director, Town Hall.

Boston. Plans approved for erection of Kitwood Boys' School in Church Road.

Camberwell. Erection of prefabricated library in Peckham Hill St., at estimated cost of £6,000.

Chingford T.C. Erection of 8 shops and two-storey maisonnettes above, at Old Church Rd., E.4. Borough Engineer, Town Hall.

Clacton (Essex) U.D.C. Construction of three blocks of 4 flats in Melbourne Rd., two blocks of 4 in Beaumont Ave., and 2 houses in Carrs Rd. W. Alston, Engineer and Surveyor, Town Hall.

Clutton (Glos.) R.D.C. Construction of 20 houses at Winford Rd. Council's architect is Thomas and Morgan and Partners, 23 Gelliwasted Rd., Pontypridd.

Docking (Norfolk) R.D.C. Construction of 20 houses on two sites. G. E. Gibson, Housing Officer, Council Offices, Docking, Kings Lynn.

Droylsden U.D.C. Construction of 62 flats off Moorside St. Frank Bradley, Council's Architect, Penny Bank Chambers, 4 Wood St., Bolton.

Dublin. Construction of 36 flats at North Strand housing area. City Treasurer, Exchange Buildings, Lord Edward Street.

Durham C.C. propose to build a hostel at Winlaton and tenders are being invited. County Architect is G. R. Clayton, County Architect's Office, Court Lane, Durham.

East Retford R.D.C. Erection of 22 houses at Mattersey with sewage disposal plant and incidental works. R. L. Gay, Clerk, Council Offices, 40 Grove St., Retford.

Farnborough (Hants) U.D.C. Tenders to be invited for installation of immersion heaters in 363 houses and flats.

Holywell (Flint) U.D.C. Construction of 23 houses at Greenfield. Architect, F. C. Roberts, Earl Chambers, Mold.

Lancaster. Construction of 40 flats in three blocks on Hala estate. City Engineer's Dept., Town Hall.

Liverpool. Construction of 672 dwellings on Kirkby estate, 110 at Garston, 117 on Croxteth estate, and 24 at Princes Park. City Architect and Director of Housing, Blackburn Chambers, Dale St., Kingsway, Liverpool 2.

Manchester. Electricity is to be installed in 277 pre-1914 flats in Victoria Sq., Oldham Rd., under a £5,400 scheme. Gas is to be retained for washing and cooking.

Midhurst (Sussex) R.D.C. Council recommended to approve plans for 60 houses at Nappers Wood.

Monaghan. Erection of 46 houses at Bally bay. D. P. O'Connor, County Secretary, Courthouse, Monaghan.

Northumberland. Permission has been received to spend £160,000 on first part of scheme for new technical college at Ashington.

Newcastle-on-Tyne T.C. Erection of 87 flats on Fairways estate. City Architect, 18 Cloth Market.

Peterlee (Durham). Erection of 108 houses on the Eden Lane site, near Horden.

Rotherham T.C. Council recommended to borrow £229,124, for 195 houses on Broom Valley estate and £142,104 for 124 houses on the Richmond Park estate.

St. Faith's and Aylsham (Norfolk) R.D.C. Erection of 14 houses at Aylsham, 10 at Sprawston, 6 bungalows and 4 houses at Salhouse. Architect is F. M. Dewing, 40 Prince of Wales Rd., Norwich.

Southport T.C. Extensions to technical college in Mornington Rd. Education Office, Pavilion Buildings, Lord Street.

South Shields T.C. Erection of 53 blocks of houses and bungalows and 3 blocks of four flats, comprising in all 118 dwellings, on Simonside Development Area. Borough Engineer, Town Hall.

Stepney. Erection of 77 dwellings in Vallance Rd. reconstruction scheme. Borough Engineer and Surveyor, London Fruit Exchange, Duval St., E.1.

Sunderland T.C. British Railways have submitted plans for new railway station. Proposals include provision of an hotel, shops and newsreel cinema.

Sunderland T.C. It is proposed to build 1,800 houses at Castletown. H. C. Bishop, borough architect, Grange House, Stockton Road.

Surbiton T.C. Erection of 46 houses on Fullers Way estate. Architect is G. Blair Imrie.

Wandsworth. Tenders to be invited shortly for erection of a block of flats in Endlesham Rd., Balham.

West Riding. C.C. recommended to approve replacement of electric lighting at Hatfield Dunscroft primary school at estimated cost of £1,000.

Widnes T.C. Erection of new office block, workshops and stores for Water Dept. Borough Architect, Brendan House, Widnes Road.

Windsor R.D.C. Construction of 12 dwellings, a block of 6 bungalows, and a block of 4 dwellings at Sunningdale. Louis H. Gray, Architect, Four Winds, Sunningdale.

OVERSEAS

New Zealand. Mr. Gainor Jackson, managing director of F. E. Jackson and Co. Ltd., Anzac Ave., Auckland, is visiting England to obtain additional U.K. agencies in hardware lines. Goods for which he seeks agencies include electrical household appliances. Firms should contact Mr. Jackson c/o McDonald Scales and Co., Ltd., Coventry Hse., 3 South Place, Moorgate, E.C.2., the firm's London buying agents.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Bernard Meggitt Ltd., 12 Albert St., Mansfield, Notts. To take over business of an electrical engineer carried on at Mansfield by Bernard Meggitt. Cap.: £5,000. Dirs.: B. Meggit, L. B. Pickworth and T. S. Smith.

Permag Equipment Ltd. Manufacturers of and dealers in magnetting or separating machines, etc. Cap.: £100. Dirs.: F. D. Clough, Wedgwood, Rosemary Hill Rd., Streetley, Staffs., and B. J. E. Bruce, 32 Silverbirch Rd., Solihull.

R.G.A. Sound Services (Plymouth) Ltd., 21 Cobourg St., Plymouth. To take over business of R.G.A. Sound Services carried on at Plymouth, manufacturers of and dealers in sound recording and public address apparatus, etc. Cap.: £1,000. Dirs.: G. W. Ackland and A. R. Neve.

Smith Bros. (Harrow) Ltd., 56 The Viaduct, South Harrow, Middlesex. Mechanical, motor, electrical, oil fuel, constructional and marine engineers, etc. Cap.: £5,000. Dirs.: F. Smith, G. Smith and W. Smith.

Eric H. Stow Ltd., 267 Farnham Rd., Slough. Manufacturers of and dealers in sound reproducing machines, television apparatus, etc. Cap.: £10,000. Dirs.: E. H. Stow (permanent) and Mrs. A. E. Stow.

W. J. Evans and Sons (Plaistow) Ltd., 7 Victoria St., S.W.1. Manufacturers of and dealers in radio receiving and transmitting apparatus, etc. Cap.: £21,000. Dirs.: Marjorie F. White, H. C. Evans and W. J. Evans.

Easipower (Service) Ltd., 213 Gloucester Place, N.W.1. Service work and other nominated contracts for Easipower Ltd., and to carry on business of manufacturers of and dealers in electrical and gas fittings and accessories, etc. Cap.: £100. Dirs.: F. R. Williams and P. H. Davies.

W. V. Fairhurst Ltd., 209 Duckworth St., Darwen. Electrical and mechanical engineers, etc. Cap.: £7,000. Dirs.: A. Leach, E. S. Jepson, H. H. Fairhurst and W. H. Fairhurst.

R. M. Catterson-Smith Ltd., Adams Bridge Works, Exhibition Grounds, Wembley, Mdx. To take over business of an electric furnace engineer carried on as "R. M. Catterson-Smith" at Wembley. Cap. £5,000. Dirs.: R. M. Catterson-Smith and F. A. E. Walford.

Powerco Ltd., Wandsworth Town Station Works, York Rd., S.W.18. Manufacturers of and dealers in electrical plant, etc. Cap.: £3,000. Permanent managing dir.: F. W. Jelpke.

J. Sharp and Co. (Cardiff) Ltd., 41 St. Alban Av., Cardiff. Electrical engineers, etc. Cap.: £600. Dirs.: J. A. Sharp and K. J. Rowland.

Wolf Electric Tools (Holdings) Ltd., Pioneer Works, Hanger Lane, Ealing, W.5. To acquire the whole of the issued share capital of Wolf Electric Tools, Ltd., and to carry on business of electrical and mechanical engineers and contractors, etc. Cap.: £100. Dirs.: to be appointed by subs. Subs.: C. J. Pollard (clerk) and J. G. Hopton (solicitor), 11 Old Jewry, E.C.2.

MEETINGS TO NOTE

THURSDAY, APRIL 12

I.E.E. (London Utilisation Section).—"Modern Developments in Electric Welding." H. G. Taylor. Savoy Pl., 5.30 p.m.

I.E.E. (Southern Centre).—Faraday lecture on "Lamps and Lighting." L. J. Davies, Guildhall, Southampton, 6.30 p.m.

I.E.E. (Swansea Sub-centre).—"Influence of Rectifier Harmonics in a Railway System on the Dielectric Stability of 33 kV Cables." S. B. Warder, E. Friedlander and A. N. Arman. Plaza Cinema, 6 p.m.

I.E.S. (Leicester Centre).—Brains Trust. E.M.E.B., Charles St., 6.30 p.m.

I.E.S. (Manchester Centre).—Annual meeting followed by "Home Lighting." J. N. Aldington. College of Technology, Sackville St., 6 p.m.

I.E.S. (Bradford Group).—Lighting Brains Trust. Y.E.B., Sunbridge Rd., 7.30 p.m.

DUNFERMLINE ELECTRIC SOCIETY.—"Rotating Machinery." H. E. C. Clapham. Unitas Hall, Queen Anne St., 7 p.m.

FRIDAY, APRIL 13

I.E.E. (N.E. Students' Section). Annual meeting and film show. King's College, Newcastle, 6.30 p.m.

I.E.E. (London Education Circle).—Discussion on "The Presentation of Laboratory Experiments." Savoy Place, 6 p.m.

I.E.E. (N. Staffs Sub-centre).—Report on "Education and Training of Electrical Technicians." K. R. Evans. King Edward Grammar School, Stafford, 7 p.m.

E.D.A.—Annual luncheon followed by A.G.M. Connaught Rooms, London.

A.S.E.E. (Crewe Branch).—"Battery Vehicles." R. D. Morgan. Crewe Arms Hotel, 7.30 p.m.

MONDAY, APRIL 16

I.E.E. (London).—Discussion on "Public Lighting." Savoy Pl., 5.30 p.m.

BIRMINGHAM ELECTRIC CLUB.—"The Mersey Tunnel."

TUESDAY, APRIL 17

I.E.E. (London Measurements Section).—Discussion on "Humidity Measurement and Control." Savoy Pl., 5.30 p.m.

I.E.E. (N. Midland Utilisation Group).—"Dimming of Low-pressure Discharge Lamps." C. E. Williams. Lighting Service Bureau, Aire St., Leeds, 6.30 p.m.

I.E.E. (Scottish Centre).—"Review of Research in Electricity Supply." C. W. Marshall.

A.S.E.E. (London).—"Telecommunications and Control Systems." T. H. Flowers. Lighting Service Bureau, Savoy Hill, 6.30 p.m.

DUMFRIES AND GALLOWAY ELECTRICAL SOC.—Annual meeting at Cairndale Hotel, Dumfries, 7.15 p.m.

WEDNESDAY, APRIL 18

I.E.E. and ROYAL SOC. OF ARTS.—Llewelyn B. Atkinson Lecture on "Electricity Supply Position." Sir John Hacking. Savoy Place, W.C.2, 2.30 p.m.

I.E.E. (Sheffield Sub-centre).—"Measurement of Light and Colour." G. T. Winch. Grand Hotel, 6.30 p.m.

I.E.E. (N. Lancs Sub-centre).—"Electrically Interlocked Guards on Machines." W. Fordham Cooper. N.W.E.B., North Rd., Lancaster, 7 p.m.

I.E.E. (Southern Centre).—Discussion on "Domestic Appliances." University College, Southampton, 6.30 p.m.

INSTN. OF WORKS MANAGERS (W. Midland Branch).—"Measurement of Productivity." W. C. Puckey of Hoover, Ltd. Grand Hotel, Birmingham, 7 p.m.

THURSDAY, APRIL 19

I.E.E. (S. Midland Students' Section).—"Design for a Radio Controlled Destroyer." I. A. McCord. G.E.C. Telephone Works, Copsewood, Coventry, 7 p.m.

I.E.E. (Irish Branch).—Annual meeting at 42 James's St., Dublin.

FRIDAY, APRIL 20

I.E.E. (N. Midland Centre).—Annual dinner and dance at Grand Hotel, Harrogate, 7.30 p.m.

I.E.S. (Birmingham Centre).—Discussion on "Street Lighting." E. Stroud and P. Crawford Sugg. Imperial Hotel, Temple St., 6 p.m.

ASSOCIATED ELECTRICAL INDUSTRIES

Increased Production

THE fifty-first annual general meeting of Associated Electrical Industries Limited was held on April 3, in London.

The Rt. Hon. Oliver Lyttelton, D.S.O., M.C., M.P., the chairman, said that 1950 had once again been a year of increased production, but they had not maintained the same rate of increase which had been achieved over the last three years. The figures had been affected towards the end of the year by the decision of the hourly rated employees at the Trafford Park Works of Metropolitan-Vickers to work only on day work and to abandon piece work. Piece work had, however, been resumed in February 1951. Deliveries of finished apparatus amounted to more than £55 million sterling during the year. The result was due in the main to the large sums which the Group companies had expended upon new equipment since the war. However highly equipped their factories might be, that massive output could only have been gained through the keenness and enthusiasm of all those employed by the Group.

It was again necessary that stockholders should realise how heavy a burden of taxation the company had to bear. During the three years, 1948-1950, the company had paid in income tax and profits tax more than £10 million and the ordinary stockholders had received dividends amounting to £3 million before the deduction of income tax, or £1,650,000 net. The figure paid out for wages and salaries for the period was £57 million and included an increase of 17% in the average earnings of those employed. In the current year the company would have paid in taxation more than five times the distributed profits. From the net profits of the year, £1,250,000 had been transferred to general reserve which now stood at £8,250,000. Other reserves stood at £2,290,000.

Oversea Orders exceed £100,000,000

The total orders on the books greatly exceeded £100 million in value, but they were well spread out over the next three or four years.

The stockholders would expect him to say something about the effects of rearmament upon the company's fortunes. Their principal preoccupation, of course, concerned the maintenance of a free flow of raw materials for their manufacturing plants. The difficulties were likely to be serious; at the same time he must point out that in any rearmament programme the electrical industry must be one of the highest priority, and they had some hopes that those shortages would only affect a small part of their business. They must, however, expect difficulties in maintaining the production of certain types of their lighter electrical appliances.

The products of the Group were essential to the life of the country. Whatever the future might hold the A.E.I. Group had an indispensable part to play. The stern tasks of rearmament and the threat of war brought many new problems. They could face them in the confidence that they were well equipped with machines and loyally served by all those who worked in their factories.

The report was adopted.

TELEGRAPH CONSTRUCTION & MAINT. CO. LTD.

Another Successful Year

THE 87th annual general meeting of The Telegraph Construction & Maintenance Co. Ltd., was held on April 10 in London, the Rt. Hon. Lord Colgrain, the chairman, presiding.

The following is an extract from his circulated statement for the year ended December 31, 1950: The Company has had another successful year. The year under review has been a very active one, while the trading results of our subsidiary and associated companies have been both satisfactory and encouraging. The balance of trading account £307,408 shows an increase of £12,601 over that of last year. This balance does not include a sum of £14,201, being a 20 per cent. dividend from our subsidiary company, The Selborne Plantation Co. Ltd.

The net profit is £160,924. The board recommend a final dividend of 5 per cent. The directors propose to augment the final dividend of 5 per cent. by distributing in addition the 1 per cent. on issued capital which was reserved last year. I explained then our reasons for this step and as, in the opinion of the directors, that position no longer applies, the dividend will be at the rate of 6 per cent., being the 5 per cent. for the final dividend for the year under review plus the 1 per cent. reserved last year in "Revenue Reserves and Undistributed Profits."

The results from our Power Cable Department were very satisfactory in view of the scarcity of orders. I am glad to say, however, that the position has now improved and there are ample orders to enable this department to make a good start in the present year, given the materials.

The Metals Division made an excellent contribution to the trading results and has started the new year with a good order book. The rolling mills have been operating very successfully, but the business which was anticipated has unfortunately been temporarily stopped due to lack of raw materials. Our scientists are actively engaged in endeavouring to make these meagre supplies go farther by the use of new compositions, and these new alloys should prove acceptable.

Our High Frequency and Communication Cable Departments have also had a satisfactory year and been reorganised to some extent to meet changes in the type of business. Exports have increased beyond last year's values and there is every reason to look forward to a good year. Our associated company, Submarine Cables Ltd., is owned equally with Siemens Brothers and Co. Ltd. The amount of submarine cable manufactured in our works during the year has been a record, both in volume and value, since the formation of the Company in 1935. Its present order book is large and its future prospects excellent.

Our Plastics and Mouldings Department has had an active and interesting year and the prospect of business for the future looks good. The export side of this business is growing immensely and plans are afoot for the expansion of this section of our activities.

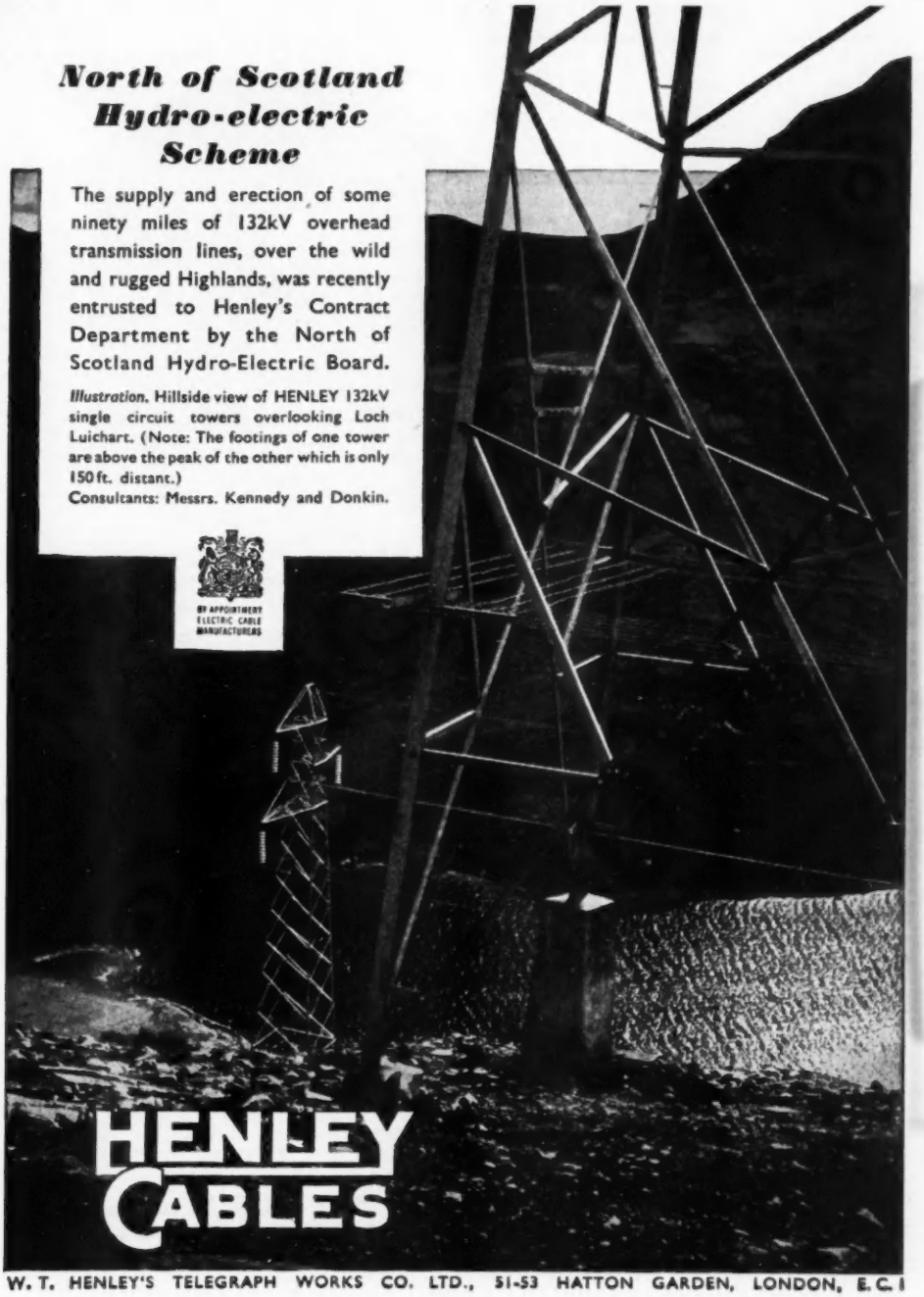
The report was adopted.

North of Scotland Hydro-electric Scheme

The supply and erection of some ninety miles of 132kV overhead transmission lines, over the wild and rugged Highlands, was recently entrusted to Henley's Contract Department by the North of Scotland Hydro-Electric Board.

Illustration. Hillside view of HENLEY 132kV single circuit towers overlooking Loch Luichart. (Note: The footings of one tower are above the peak of the other which is only 150 ft. distant.)
Consultants: Messrs. Kennedy and Donkin.

BY APPOINTMENT ELECTRIC CABLE MANUFACTURERS

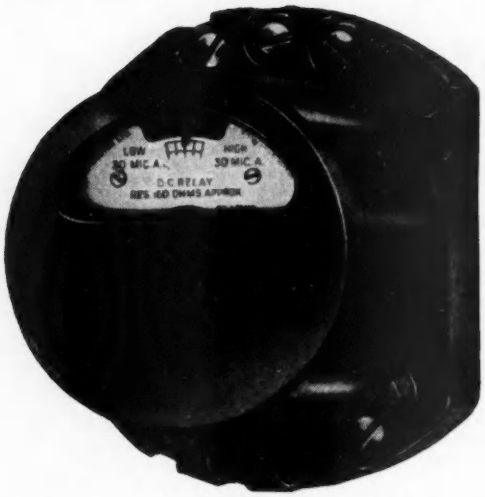


HENLEY CABLES

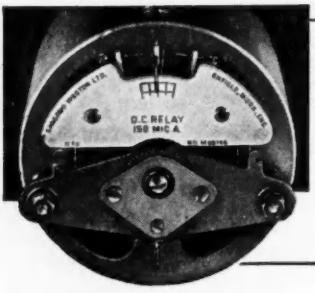
W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

FEATURES OF WESTON SUPERIORITY

Weston
MOVING COIL RELAYS



This modern range of relays is ideal for all Laboratory or Industrial Purposes. Built on the permanent-magnet moving coil principle, unaffected by external magnetic fields, the precious metal contacts will not oxidise or tarnish, and the high torque developed ensures positive contact pressure. Supplied in Bakelite casing. Most applications call for special requirements and enquiries should therefore enclose a diagram of the circuit to be closed and state (a) High and/or low contact adjustment; (b) mounting position; (c) resistance; (d) values of current and voltage in local circuit and whether DC or AC; (e) values of resistance and any inductance or capacitance in local circuit; and (f) any special accuracy required. Every 'Weston' relay is specially designed to give the best possible performance for its individual purpose. (The Model illustrated is S54.)



ACCURACY OF ADJUSTMENT. Special note should be made of the reduction gearing which enables the *user* to make accurate adjustment with absolute ease. The accuracy and rigidity of the mounting ensures constant centring after adjustment. Yet another special 'Weston' feature.

SANGAMO WESTON LIMITED

ENFIELD, MIDDLESEX: Telephone: Enfield 3434 (6 lines) & 1242 (4 lines) Telegrams: Sanwest, Enfield.

BRANCHES: GLASGOW, MANCHESTER, NEWCASTLE-ON-TYNE, LEEDS, LIVERPOOL, WOLVERHAMPTON, NOTTINGHAM, BRISTOL, SOUTHAMPTON AND BRIGHTON

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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 35s. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

CITY OF BELFAST
ELECTRICITY DEPARTMENT

TENDERS are invited as under:—
INDOOR SWITCHGEAR. The supply, delivery and erection of 33 kV 1,500 MVA open-type indoor switchgear of the air-blast or small oil-volume type.

Form of tender (No. N.1016), conditions and specification, in quadruplicate, may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1, on payment of a deposit of 5 gns. (cheques to be made payable to the Belfast Corporation Electricity Department), which deposit will be refunded provided a bona fide tender be lodged and not withdrawn. Extra copies of the contract documents may be obtained at 3 gns. per set, which sum will not be returnable.

Latest time for receipt of tenders, to be lodged in quadruplicate: 4 p.m. on Friday, May 25, 1951.

CONTROL EQUIPMENTS AND CONTROL SWITCHES. The supply and delivery of street lighting remote control equipments and control switches.

Form of tender and specification (No. G.162) may be obtained at the Electricity Department, East Bridge Street, Belfast, on payment of a deposit of 1 gn. (cheques to be made payable to the Belfast Corporation Electricity Department), which deposit will be refunded provided a bona fide tender be lodged and not withdrawn. Extra copies may be obtained at ½ gn. each, which sum will not be returnable.

Latest time for receipt of tenders: 4 p.m. on Friday, April 27, 1951.

The following conditions apply to the above-mentioned tenders: Each tender, in sealed envelope marked "Tender for . Electricity Committee" and endorsed with the name and address of the tenderer, must reach the undersigned not later than the time specified.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
April 6, 1951. (K 389)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
South Caledonia Area
33 kV OVERHEAD TRANSMISSION LINE

TENDERS are invited for the supply, delivery and erection of approximately twenty miles route length, single circuit, steel cored aluminium, wood pole line between Balthayock and Blairgowrie, in the County of Perth.

Copies of the tender document may be obtained on or before Friday, April 20, 1951, on application to the engineers, Messrs. Kennedy & Donkin, 12 Caxton Street, London S.W.1. Application should be accompanied by a cheque for £1 1s. which will be returned on receipt of a bona fide tender.

The Board do not bind themselves to accept the lowest or any tender.

W. D. D. FENTON,
Secretary.
(K 372)

APPOINTMENTS VACANT

DRAUGHTSMAN wanted by makers of industrial electrical control gear. London area.—Full details, experience, age and salary to Box No. 5033, Electrical Times. (K 352)

BRITISH ELECTRICITY AUTHORITY
SENIOR ASSISTANT ENGINEERS
GENERATION CONSTRUCTION
SUB-DEPARTMENT, HEADQUARTERS

APPLICATIONS are invited for two appointments as Senior Assistant Engineers in the Co-ordination Branch of the Generation Construction Sub-Department at Headquarters in London.

Candidates must hold the requisite qualifications for Associate Membership of either the I.MechE. or the I.E.E. Practical experience in the construction of modern power stations, including handling of contracts, preparation of commissioning programmes, practical experience of work on site and general co-ordination of the work from inception of the project to ultimate commissioning are essential, and only those possessing such experience need apply.

Those appointed will require to be responsible for co-ordinating generation constructional work at a group of power stations They will be based at Headquarters but their duties will entail attendance at site meetings and visits to power stations in various parts of the country.

Starting salaries for the appointments, which are superannuable, will be determined according to qualifications and experience within Grade 1 of the N.J.B. Agreement, £912 p.a. to £1,169 p.a., rising to a maximum of £1,285 p.a. all inclusive of London Allowance.

Applications, stating age, present salary, and giving full details of qualifications and experience, should be forwarded to D. Moffat, Director of Establishments, British Electricity Authority, British Electricity House, Great Portland Street, London W.1, so as to be received not later than April 27, 1951.

Please quote Reference AE/153. (K 403)

BRITISH ELECTRICITY AUTHORITY
North Eastern Division
THIRD ASSISTANT ENGINEER
Technical Department (Calculations and System Planning)

APPLICATIONS are invited for the above-mentioned appointment at Divisional Headquarters, Newcastle-upon-Tyne.

Candidates should have technical qualifications of at least Graduate I.E.E. standard, and experience connected with a large inter-connected power system. A University degree would be an advantage.

The engineer appointed will be required to carry out system-fault and load-flow calculations, and assist in planning and the preparation of reports. Experience in similar work is very desirable.

The salary will be in accordance with the National Joint Board Agreement, Grade 5, Schedule "C" (£579 to £753 per annum) and will commence at a point commensurate with qualifications and experience.

Superannuation will be in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Forms of application may be obtained from the Divisional Secretary (Establishments), British Electricity Authority, North Eastern Division, Carliol House, Newcastle-upon-Tyne 1, to whom they should be returned to arrive not later than April 28, 1951. (K 407)

BRITISH ELECTRICITY AUTHORITY

ASSISTANT MAINTENANCE ENGINEER (ELECTRICAL) Croydon "B" Power Station. Higher National Certificate preferable. Experience in maintenance of alternators, E.H.T. and l.t. switchgear, motors and all power station electrical and auxiliary plant essential. N.J.B. conditions of service and salary, Class "J," Grade 9, commencing at £678 6s. 8d. p.a. including London allowance.—Applications, on forms obtainable from Divisional Secretary, B.E.A., D.E. Division, Lower Ham Road, Kingston on Thames, to be returned by April 21, 1951. (K 382)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

MAINTENANCE ENGINEER (MECHANICAL)

APPLICATIONS are invited for the position of Maintenance Engineer (Mechanical) at Blackburn Meadows Power Station, Sheffield. Conditions of service and salary will be in accordance with the National Joint Board Agreement, Class "H," Grade 7, £692-£722 per annum.

Applicants must have a good technical training and have administrative ability, with a wide experience in power station mechanical maintenance and in particular the planning and progressing of turbine and auxiliary overhauls. Experience in a manufacturer's works will be an advantage. The appointment will be subject to the provisions of the Authority's superannuation scheme.

Forms of application may be obtained from the Divisional Secretary, British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Road, Leeds 7, to whom completed forms should be returned within 14 days of the appearance of this advertisement. Envelopes to be endorsed "Maintenance Engineer (Mechanical) Blackburn Meadows Power Station."

G. A. VOWLES,
Divisional Controller.
(K 374)

NORTH EASTERN ELECTRICITY BOARD

Accountant's Department, Wear Sub-Area

PRINCIPAL ASSISTANT

APPLICATIONS are invited for the position of Principal Assistant in the Wear Sub-Area, Accountant's Department with headquarters at Sunderland.

The appointment will be within Grade 7 of the National Joint Council Salary Agreement, viz: £705 by £30 to £795 per annum, commencing salary according to experience and qualifications. The selected applicant will be required to enter the British Electricity Authority and Area Boards' Superannuation Scheme.

The successful candidate will be responsible to the Sub-Area accountant for the supervision of staff in the department. It is essential he should have a sound practical knowledge of accountancy, including consumer accounts and costs and stores accountancy, preferably in a public utility undertaking. Knowledge and experience of a punched card accountancy system will be an advantage.

Applications, in writing, stating age, qualifications and experience, together with the names and addresses of two persons to whom reference may be made, should be forwarded to the Secretary, Establishments Section, The North Eastern Electricity Board, Carliol House, Newcastle-on-Tyne 1, within 14 days of publication of this advertisement. (K 383)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following position in the Bristol Sub-Area:—

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER (Western District)
(Headquarters, Weston-super-Mare)

Commencing salary £627 per annum. (Class "E," Grade 6, N.J.B. Schedule).

Candidates should have a sound theoretical and practical knowledge of installation and contracting work, I.E.E. and Factory Regulations, and be capable of advising consumers on tariffs and costs.

Experience in rural development work and the possession of appropriate technical qualifications will be an advantage.

Detailed applications, stating present position and salary, age, qualifications and experience, to be submitted to the District Manager (Weston), South Western Electricity Board, 19/20 Waterloo Street, Weston-super-Mare, Somerset, within ten days.

(K 406)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointment:—

No. 5 (Wakefield) Sub-Area

Vacancy No. 62/50.

THIRD ASSISTANT DISTRICT ENGINEER (Barnsley).

Applicants must have had experience in a large undertaking employing E.H.V. and L.V. underground mains. Experience in fault location, supervision of jointing, cable laying, and the erection of overhead lines would be an advantage.

Preference will be given to Corporate Members of the Institution of Electrical Engineers.

Salary: N.J.B. Schedule, Class "F", Grade 9, £538-£560 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, within 14 days of the appearance of this advertisement. (K 411)

BRITISH ELECTRICITY AUTHORITY

South Western Division

POWER STATION SUPERINTENDENT
EXETER POWER STATION

APPLICATIONS are invited for the appointment of Power Station Superintendent at Exeter Power Station, South Western Division.

Candidates should be qualified engineers with practical experience in the operation and maintenance of a steam power station. They should also have had experience in the administrative duties involved and in the control of technical and manual employees.

Conditions of service and salary will be in accordance with the National Joint Board Agreement Class "D", Grade 1, £883 to £997 per annum.

Applications, stating age, qualifications, full details of experience, present appointment and salary, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Clifton, Bristol 8, so as to be received not later than April 21, 1951.

R. C. BARRETT,
Divisional Secretary.
April 6, 1951. (K 412)

BRITISH ELECTRICITY AUTHORITY

3RD ASSISTANT ENGINEER (OVERHEAD LINES)
CHIEF ENGINEER'S DEPARTMENT, LONDON

APPLICATIONS are invited for the appointment of 3rd Assistant Engineer (Overhead Lines) in the Transmission Design Branch at Headquarters in London.

Candidates should have educational qualifications not less than those required for Associate Membership of the Inst.C.E. or the I.E.E. They should have experience in the design, construction and maintenance of high voltage steel tower overhead lines. Familiarity with calculations in the detailed design of the steel towers themselves and the design of foundations in varying classes of ground, would be an advantage.

The duties will be to study new developments, to analyse and follow up the results of service experience and to advise on the application of new equipment and new methods to the authority's high-voltage transmission systems.

The starting salary for the appointment, which is superannuable, will be in accordance with age and experience, within Grade 4 of the N.J.B. Agreement, £676 to £807 p.a., rising to £891 p.a., including London Allowance.

Applications, stating age, present salary, and giving full details of qualifications and experience, should be forwarded to D. Moffat, Director of Establishments, British Electricity Authority, British Electricity House, Great Portland Street, London W.1, so as to be received not later than April 27, 1951.

Please quote Reference AE/151. (K 404)

BRITISH ELECTRICITY AUTHORITY

South East Scotland Division

GENERAL ASSISTANT ENGINEER

APPLICATIONS are invited for the appointment of General Assistant Engineer, Class "AX/BX," (8), in the department of the Transmission Engineer at Portobello, commencing salary £437 per annum. Salary and conditions of service will be in accordance with the N.J.B. Agreement, and the appointment will be superannuable under the terms and conditions of the Authority's Superannuation Scheme.

Applicants should possess a Higher National Certificate in Electrical Engineering or its equivalent and preferably should have had some works training.

Applications, stating age, qualifications and experience, should be addressed to the Divisional Controller, British Electricity Authority, South East Scotland Division, British Electricity House, High Street, Portobello, Midlothian, not later than 14 days from the publication of this advertisement.

J. F. FIELD,
Divisional Controller.
(K 365)

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited for the post of SHIFT CHARGE ENGINEER at the Greenhill generating station, Oldham. The salary range for this position, which is superannuable, will be £579/£809 per annum, in accordance with Grade 7, Class "E," of the National Joint Board Agreement.

Candidates should preferably possess technical qualifications, and previous experience in a generating station is essential.

Applications, stating age, qualifications, present position, and giving full details of education and experience, should be received by The Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than April 21, 1951. (K 373)

MIDLANDS ELECTRICITY BOARD

South Staffs. and North Worcs. Sub-Area

SECOND ASSISTANT ENGINEER (CONSTRUCTION)

APPLICATIONS are invited for the position of Second Assistant Engineer (Construction) at Sub-Area Headquarters, Toll End Road, Tipton, Staffs.

Applicants should have had considerable experience in the construction of substations, overhead lines, and underground cables at voltages up to and including 33 kV both by direct labour and by contract. Preference will be given to candidates with appropriate technical qualifications.

Conditions of service will be in accordance with the National Joint Board Agreement for the electricity supply industry and the salary will be in accordance with Class "L," Grade 7, £641 per annum. The successful applicant will be required to contribute to the B.E.A. and Area Boards superannuation scheme if eligible.

Applications, stating age, education, qualifications, experience, present position and salary, should be forwarded within fourteen days to Sub-Area Manager (Ref. C.W.), Midlands Electricity Board, Toll End Road, Tipton, Staffs.

March 30, 1951. (K 375)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

APPLICATIONS are invited for the appointment of GENERAL ASSISTANT ENGINEER (Instructor) at the Divisional Training Centre at Queensferry, Flint.

The duties will include the supervision and instruction of craft and student apprentices and graduate trainees in basic workshop practice, the necessary demonstrating, lecturing and general clerical work in connection with the centre. Candidates must have served a recognised workshop apprenticeship and have had experience of instructing in the use of hand and machine tools, methods of heat treatment, elementary electrical practice, etc.

The salary will be in accordance with the National Joint Board, Schedule "C," Class "AX," Grade 8, i.e. £437/£569, according to qualifications and experience, rising to a maximum of £604. The appointment will be superannuable under the terms and conditions of the British Electricity Authority and Area Boards' Superannuation Scheme and may be subject to a medical examination.

Forms of application may be obtained from the Divisional Secretary, Clarke Gardens, Woolton, Liverpool, and returned to him not later than Friday, April 27, 1951.

A. R. COOPER,
Divisional Controller.
(K 38

MIDLANDS ELECTRICITY BOARD

North Staffordshire Sub-Area

APPOINTMENT OF DISTRICT ENGINEER—MARKET DRAYTON

APPLICATIONS are invited for the above position in the North Staffs. Sub-Area.

Applicants must have had considerable experience in all branches of distribution work, including the operation and maintenance of high and low voltage cables, overhead lines, substations, protective gear etc. Candidates with appropriate technical qualifications will be preferred.

The appointment will be in accordance with National Joint Board conditions and the salary will be Class "B," Grade 3, £653 per annum.

Applications, stating age, qualifications, experience, present position and salary, should be forwarded within 14 days to: Mr. H. A. P. Caddell, Manager, North Staffordshire Sub-Area, 31 Kingsway, Stoke-on-Trent.

A. STEPHENS,
Secretary.
April 3, 1951. (K 401

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the position of ASSISTANT SHIFT CHARGE ENGINEER at Walsall Generating Station Class "G", Grade 9, commencing salary £571 per annum.

Applicants should possess the National Certificate in mechanical engineering or an equivalent qualification and should have had sound technical training. Experience in power station operation will be considered an advantage.

Salary and conditions of service will be in accordance with the N.J.B. Agreement, and superannuation under terms approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Divisional Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, and be returned not later than April 28, 1951.

F. W. LAWTON,
Divisional Controller.
(K 410)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

ASSISTANT SHIFT CHARGE ENGINEER, BURTON-ON-TRENT

APPLICATIONS are invited for the position of Assistant Shift Charge Engineer at Burton-on-Trent Generating Station. Applicants should have sound technical qualifications and experience in the operation and maintenance of modern power stations.

The salary will be in accordance with Class "E," Grade 9, and the appointment will be superannuable under the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, not later than April 23, 1951.

W. S. BURGE,
Divisional Controller.
British Electricity House,
Barker Gate, Nottingham. (K 349)

SOUTH EASTERN ELECTRICITY BOARD

Mid-Sussex Sub-Area Headquarters

THIRD ASSISTANT ENGINEER

SALARY £571 p.a. rising to £597 p.a. under the N.J.B. Schedule, Class "H," Grade 10. Superannuation will be arranged. Minimum technical qualification, Higher and Ordinary National Certificates in Electrical Engineering. Applicants must have had training in distribution engineering and experience in planning, construction, operation and maintenance of urban and rural systems up to and including 33 kV. Particular knowledge of protective system design, operation and testing will be an advantage.

Applications, giving two referees, must reach H. Pryce-Jones, M.Eng., M.I.C.E., Mid-Sussex Manager, South Eastern Electricity Board, Electric House, Castle Square, Brighton, by April 23, 1951.

A. L. BURNELL,
Secretary.
April, 1951. (K 380)

BRITISH ELECTRICITY AUTHORITY

GENERAL ASSISTANT ENGINEER
CHIEF ENGINEER'S DEPARTMENT, HEADQUARTERS

APPLICATIONS are invited for the post of General Assistant Engineer in the Generation Operation Branch at Headquarters in London.

The duties will be to assist in the keeping of records, the production of technical returns and the investigation and analysis of generating station operating results.

The candidate should possess ability in mathematics, should preferably have experience of power station operation, repairs and maintenance, and should be able to report results in good, simple English.

The starting salary will be within Grade 5 of the N.J.B. Agreement, £490 to £524 p.a., according to qualifications and experience, rising to a maximum of £589 p.a., including London Allowance.

Applications, stating age, present salary, and giving full details of qualifications and experience, should be forwarded to D. Moffat, Director of Establishments, British Electricity Authority, British Electricity House, Great Portland Street, London W.1, so as to be received not later than April 27, 1951.

Please quote Reference AE/152. (K 405)

CROWN AGENTS FOR THE COLONIES

ELECTRICAL ENGINEER (Hydro-Electric) required by the Central Electricity Board, Federation of Malaya, for 3 years with prospect of permanency. Salary (including Expatriation Pay) payable in local currency, equivalent at the present Government rate of exchange to £742 a year, rising to £1,652 a year. Commencing salary according to age and experience. Cost-of-living allowance equivalent to between £210 and £525 a year, according to salary, and dependants. Free passages. Liberal leave on full salary. Candidates, between 24 and 35 years of age, must be Corporate Members or Graduates of the Institution of Electrical Engineers (or the equivalent), and have had sound training in both electrical and mechanical engineering, with experience in the operation of medium electricity supply undertakings. They should possess a competent knowledge of the erection and maintenance of high- and low-tension overhead and underground a.c. distribution systems and sub-station plant. Experience in maintenance and operation of diesel engines a distinct advantage. Preference will be given to candidates with experience of hydro-electrical construction. Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting M.25728.B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (K 402)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions on the staff of the Transmission Engineer at Divisional Headquarters, Portsmouth:—

(a) SENIOR ASSISTANT ENGINEER—Construction

Applicants should have considerable experience in the design, layout and erection of high voltage transmission lines, substations and their equipment. Ability to deal with contract correspondence is essential.

(b) THIRD ASSISTANT ENGINEER—Cables

Experience in the design, manufacture, installation, testing and maintenance of high voltage cables up to a voltage of 132 kV is essential.

(c) THIRD ASSISTANT ENGINEER—Overhead Lines

Candidates should have experience in the design and construction of overhead lines up to a voltage of 132 kV, with practical knowledge and experience of making line surveys, plotting profiles, checking tower foundations and supervision of overhead line contractors.

(d) THIRD ASSISTANT ENGINEER—Civil and Electrical Clerk of Works

Candidates should have experience of electrical and civil constructional work in high voltage substations up to a voltage of 132 kV.

(e) GENERAL ASSISTANT ENGINEERS

(i) Construction—Overhead Lines
(ii) Construction—Switchgear and Transformers
(iii) Construction—Electrical and Civil Work

Preference will be given to candidates with a knowledge of the construction, maintenance and operation of a high voltage system, and a works training on high voltage switchgear and transformers. Experience gained with a contractor on high voltage overhead lines, preferably 132 kV, will be an advantage.

Applicants for appointment (a) should be Corporate Members of one of the senior professional engineering institutions.

For other appointments the candidates should be Corporate Members of a professional engineering institution or hold qualifications leading to Corporate Membership.

Salary and conditions of service in accordance with N.J.B. Agreement.

Salary appointment: (a) Schedule "C," AX/1 (£884 to £1,045); (b), (c) and (d) Schedule "C" AX/5 (£579 to £731); (e) Schedule "C" AX/8 (£437 to £586).

The positions are superannuable in accordance with the Authority's scheme, and a medical examination may be required.

Forms of application can be obtained from the undersigned and should be returned to the address given below not later than Friday, April 27, 1951.

P. D. A. OLIVER,
Divisional Secretary.

British Electricity House,
111 High Street, Portsmouth. (K 399)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 32/51

APPLICATIONS are invited for the appointment of DEPUTY POWER STATION SUPERINTENDENT, Roath Power Station, Cardiff, at a salary in accordance with the Revised National Joint Board Agreement, Class "F," Grade 3 (£827 to £865 per annum).

Applicants should preferably be Corporate Members of the Institute of Mechanical or Electrical Engineers, and should have had wide experience in the operation, maintenance and administration of a Power Station with modern generating plant.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards Scheme.

Forms of application may be obtained from the Divisional Secretary's Office at the address below, to whom completed applications should be returned not later than April 23, 1951.

H. V. PUGH,
Divisional Controller.

Cardiff (Pengam Moors) Airport,
Cardiff.
April 4, 1951. (K 397)

SOUTH WESTERN ELECTRICITY BOARD

VACANCIES exist for two SURVEYORS in the Board's Central Construction Department, at Taunton. Candidates should possess a recognised surveying qualification and have had three years' experience, preferably on overhead line work in the industry.

Provisional salary within the range £400-£500 per annum.

Applications, giving age, present appointment and salary, qualifications and experience, to be submitted to Assistant Secretary (Establishments), Electricity House, Colston Avenue, Bristol 1, within ten days.

April 5, 1951. (K 413)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the No. 4/5 Sub-Area (North Wales) of the Board:—

(1) SECTION ENGINEER (Operation), based on Rhyl. Salary in accordance with N.J.B. Class "D," Grade 7 (£563 to £573 per annum).
(2) COMMERCIAL ASSISTANT (Male) based on (a) Llandudno, (b) Pwllheli. Salary in accordance with N.J.B. Class "D," Grade 8 (£524 to £542 per annum).

Applicants for post (1) should have experience in all branches of work associated with distribution, including design, construction and operation of e.h.t., h.t. and l.t. overhead and underground systems, and indoor and outdoor substation equipment. The district is comprised of both rural and urban areas.

The duties of posts 2 (a) and 2 (b) will include responsibility to a District Commercial Officer for the sale of appliances and general organisation of the Service Centre, dealing with applications for supply (rural and urban), the preparation of estimates for installation work including the supervision of contracting staff, and where necessary, enquiries on changeover schemes. The ability to speak Welsh would be an added qualification, especially for post 2 (b). The appointment in Llandudno carries with it the service tenancy of a self-contained flat above the Service Centre.

The appointments are superannuable and subject to medical examination.

Applications, on forms to be obtained from the Manager, No. 4/5 Sub-Area, Merseyside and North Wales Electricity Board, Electricity House, Rhostyllen, Wrexham, should be completed and returned not later than April 23, 1951.

JAMES RANKIN,
Secretary.
(K 409)

SOUTHERN ELECTRICITY BOARD

APPLICATIONS are invited for the following posts:—

CONSTRUCTION ENGINEER

Uxbridge District of No. 1 (Southall) Sub-Area. Salary, N.J.B. Class "E," Grade 7 (£579 to £594 to £609 per annum plus 5 per cent. London Weighting). N.J.B. Conditions of Service.

Duties will include taking charge, under the District Engineer, of the installation and erection of plant, equipment, laying of mains, indoor and outdoor substations and other constructional work, by direct labour and/or by contract, on an urban distribution system up to and including 11 kV.

Applicants should be at least Graduate Members of the I.E.E., or possess equivalent qualifications, with several years' experience in construction work as defined above. The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 2/6 Windmill Lane, Southall, Middlesex, and returned to him not later than ten days after the appearance of this notice.

ELECTRICAL FITTER

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Rate of pay (3s. 0½d. per hour) and conditions of service in accordance with N.J.I.C. Agreement for the Electricity Supply Industry.

Candidates must have a first class knowledge of electrical fitting and have served an apprenticeship in the trade. Experience in substation switchgear and on-load tap changing equipment would be an advantage.

Applications, in writing, stating age and qualifications, are to be forwarded to the District Manager, The Manor House, Winchester Road, Basingstoke, not later than ten days after the appearance of this notice.

F. W. KEMPTON,
Secretary.
(K 396)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

Southern Sub-Area

APPLICATIONS are invited for the post of ASSISTANT ENGINEER (Hawick District). Salary and conditions of service will be in accordance with the N.J.B. Schedule, Class "B," Grade 7 (£492-£505-£518).

Applicants should have experience in the construction, operation and maintenance of h.v. and l.v. rural and urban distribution systems and must have had a sound practical training. Preference will be given to those holding the Higher National Certificate or equivalent. The appointment will be superannuable under the B.E.A. and Area Boards' superannuation scheme.

Applications, stating age and particulars of education, training, experience, and positions held, should reach the undersigned not later than 14 days after the appearance of this advertisement.

G. H. SANKEY,
Sub-Area Manager.

High Street, Galashiels. (K 381)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Commercial Department

SALESMAN—Commercial Refrigeration 35/51/N.

Vacancies occur for Salesmen to specialise in commercial refrigeration equipment, operating from Sub-Area Headquarters at:

(i) Norwich
(ii) Stowmarket.

Applicants must be fully experienced in handling enquiries for all types of equipment, including food storage and milk cooling, and must be capable of initiating business and must have a proved sales record.

Salaries for these appointments will be in accordance with Grade 3 of the National Joint Council Salary Agreement, dated March 23, 1950—(£450 by £20 to £510 per annum).

Applications in writing, giving fullest particulars of training, experience, sales record, and details of present employment and salary, should, according to the locality in which employment is preferred, be addressed to the Manager,

(i) Norfolk Sub-Area, Duke Street, Norwich.
(ii) Suffolk Sub-Area, Finborough Hall, Stowmarket.

Luton District

ASSISTANT DISTRICT COMMERCIAL ENGINEER 39/51/R

Applicants must have a good general and technical education, preferably Corporate Members of the Institution of Electrical Engineers, with particular experience in electrical contracting and maintenance work.

The selected applicant would be responsible to the District Commercial Engineer for commercial development, supervision of wiring installation work, including estimating all types of industrial, agricultural and domestic installations, and such general consumer advisory service as would be anticipated in a District having important industrial, agricultural and housing development. He would also be responsible for operating an efficient maintenance service.

The provisional salary for the appointment will be £675 per annum, but subject to modifications in accordance with the terms and conditions laid down from time to time by the appropriate negotiating bodies.

Applications in writing, giving details of age, qualifications, experience, and details of present employment and salary, should be addressed to the District Manager, Eastern Electricity Board Electricity Offices, St. Mary's Road, Luton.

Special Note.—In the case of this appointment, applications must be received within seven days of the appearance of this advertisement.

Essex Sub-Area

Thurrock and Southend Districts

DEMONSTRATORS 36/51/N

Applicants should have had a domestic science training, including electrical housecraft, and should preferably hold the E.A.W. Certificate. They should be competent to plan and give cookery demonstrations including lectures and advice to consumers on the utilisation of domestic appliances. Previous experience in an Electricity Service Centre is desirable.

The salary will be within Grade 1 salary range, £310 to £390, of the National Joint Council Salary Agreement dated March 23, 1950.

Applications in writing, stating age, qualifications, experience, and details of present employment and salary, should be addressed to:

For the Thurrock District—
The District Manager, Eastern Electricity Board, Maidstone Road, Grays, Essex.

For the Southend District—
The District Manager, Eastern Electricity Board, 85 London Road, Southend-on-Sea, Essex.

Fens Sub-Area

Cambridge District

DISTRICT ENGINEER 8/51

Applicants should have had a good general and technical education and extensive experience in the planning, construction, operation and maintenance of underground and overhead electricity supply systems, control of staff, and administration. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

The salary will be in accordance with the National Joint Board Agreement—Grade 3, Class "E," £775 to £809 per annum.

Applications, in writing, stating age, qualifications, experience and details of present employment and salary, should be addressed to the District Manager, Cambridge, Eastern Electricity Board, 4 Market Hill, Cambridge.

Norfolk Sub-Area

King's Lynn and Western District

DEMONSTRATOR 10/51

Applicants should have had Domestic Science training, including electrical housecraft, and should preferably

(*Continued in next column*)

(*Continued from previous column*)

hold the E.A.W. certificate. They should be competent to plan and give cookery demonstrations, including lectures and advice to consumers on the utilisation of domestic electrical appliances. Previous experience in an Electricity Service Centre is desirable.

The salary will be in accordance with Grade 1 (£310 by £20 to £390) of the National Joint Council Salary Agreement dated March 23, 1950.

Applications in writing, stating age, qualifications, experience, and details of present employment and salary, should be addressed to The Manager, King's Lynn and Western District, Eastern Electricity Board, Gaywood Bridge, Wooton Road, Gaywood, King's Lynn.

Both future salaries and conditions of service for these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme, and may be required to undergo a medical examination.

Applications should be addressed to the person concerned so as to arrive within fourteen days of the appearance of this advertisement except in the case of No. 39/51R.

April 6, 1951. (K 395)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 37/51

APPLICATIONS are invited for the following appointments:—

(a) ASSISTANT SHIFT CHARGE ENGINEER, Tir John Power Station, at a salary in accordance with the Revised National Joint Board Agreement, Class "G," Grade 9 (£571 to £597 per annum).
(b) DRAUGHTSMAN in the Transmission Department, Divisional Headquarters, at a salary within the range (£375 to £536 per annum). This salary is provisional pending negotiation through the National Joint Board.

Applicants for both appointments should preferably have obtained the Higher National Certificate, and those for (a) should have served a recognised apprenticeship.

Experience in the operating of a modern Power Station using pulverised fuel boilers is essential for appointment (a), whereas knowledge and experience of substation plant and layout would be considered an advantage for appointment (b).

The appointment is superannuable in accordance with the British Electricity Authority and Area Boards' Scheme.

Forms of application may be obtained from the Divisional Secretary's Office at the address below, to whom completed applications should be returned not later than April 28, 1951.

H. V. PUGH,
Divisional Controller.

Cardiff (Pengam Moors) Airport,
Cardiff. (K 400)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 34/51

APPLICATIONS are invited for the position of ELECTRICAL FITTER in the Transmission Section of this Division, to be situated at Neath Section Office, at the current rate of 3s. 0½d. per hour.

Wages and conditions of service will be in accordance with the National Joint Industrial Council Agreement.

Applicants should preferably be conversant with the maintenance of high voltage electrical sub-station equipment.

Possession of a current driving licence would be considered an advantage.

Applications should be made in writing to the Section Engineer, British Electricity Authority, South Wales Division, Riverside, Neath, Glam., not later than April 18, 1951.

H. V. PUGH,
Divisional Controller.

Cardiff (Pengam Moors) Airport,
Cardiff.
April 4, 1951. (K 398)

SOUTH WESTERN ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN required at No. 2 Sub-Area Headquarters, Taunton. Provisional salary within the range £400-£450 per annum. Candidates should have a thorough knowledge of general mains distribution, and be able to read manufacturers' drawings of switchgear. Possession of O.N.C. or equivalent qualification preferable.

Applications, stating age, experience and present position and salary, should be submitted to Sub-Area Manager, South Western Electricity Board, The Parade, Taunton, within ten days. (K 414)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Chief Engineer's Department at Area Board Headquarters:—

(1) SENIOR ASSISTANT ENGINEER (Planning Section)

(2) SECOND ASSISTANT ENGINEER (Technical Section)

The salaries will be in accordance with the National Joint Board Agreement, and initially within the following ranges:—

Post (1): £884 to £1,015 per annum, AX.1.

Post (2): £752 to £884 per annum, AX.2.

and subsequently according to the classification of the Area, which is approaching Class "DX."

Applicants for post (1) should be Chartered Electrical Engineers with good technical qualifications. They should have experience of the design, construction and operation of distribution systems and a good knowledge of the technical and economic factors involved in system design. Experience in system layout and design at all voltages up to 33 kV, and in the preparation of complete distribution schemes and estimates is desirable. The successful candidate will be required to undertake work on his own responsibility.

Applicants for post (2) should have the technical qualifications to enable them to become Chartered Electrical Engineers, and have experience in the following branches of Distribution Engineering: Fault calculations and investigations, protective gear application and testing, metering, remote control and telecommunications.

The appointments will be superannuable and subject to medical examination.

Application forms, obtainable from the Establishments Officer, Merseyside and North Wales Electricity Board, Electricity House, Love Lane, Pall Mall, Liverpool 3, should be completed and returned so as to be received not later than April 26, 1951.

JAMES RANKIN,
Secretary.
(K 408)

MIDLANDS ELECTRICITY BOARD

South Staffs. and North Worcs. Sub-Area

APPOINTMENT OF GENERAL ASSISTANT ENGINEER DUDLEY DISTRICT

APPLICATIONS are invited for the above appointment in the Dudley District of the South Staffs. and North Worcs. Sub-Area. Applicants should have had experience in all branches of distribution work, including operation and maintenance of high voltage and low voltage underground cables, substations, etc. Appropriate technical qualifications will be considered an advantage.

The conditions of service will be in accordance with the N.J.B. Agreement and the salary, subject to negotiations, will be Class "E," Grade 11, £459.

Applications, in writing, stating age, qualifications, experience and present salary, should be forwarded within seven days to Mr. T. G. Keeler (Ref. C.W.), Sub-Area Manager, Midlands Electricity Board, South Staffs. and North Worcs. Sub-Area, Toll End Road, Tipton, Staffs.
March 30, 1951. (K 376)

AN ASSISTANT ENGINEER is required for work in connection with the application of semi-conductors (in particular, voltage dependent materials) to industry. Applicants must be of Higher National to degree standard. Salary according to age, qualifications and experience.—Reply, giving full particulars, including age, education, experience, qualifications, etc., marking envelopes "Research," to Personnel Manager, Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester 17. (K 342)

ELECTRICAL/MECHANICAL INSPECTOR

An Electrical-Mechanical Inspector is required by a major British Oil Company for service in the Middle East. Applicants must have wide experience covering maintenance and inspection of installed plant associated with modern large generating stations with voltage range of 33 kV to 440 volts. Knowledge of flameproof switchgear an advantage. Possession of H.N.C. essential and qualifications up to A.M.I.E.E. desirable. Age limit 37 years. Attractive salary plus generous allowance in local currency designed to assist substantially in meeting cost of living, free passages, kit allowance, free medical attention, good leave arrangement, pension scheme.

Write, giving personal particulars, and details of qualifications and experience, quoting Dept. F.7, to Box 3291 at 191 Gresham House, London, E.C.2. (H 270p)

SWITCHGEAR

Johnson & Phillips Ltd. require two SENIOR DRAUGHTSMEN. Applicants must be suitably qualified and competent to handle switchgear for indoor and outdoor main stations and sub-stations up to 33,000 V, or to design switchgear apparatus embracing air break and oil break circuit breakers. Both positions offer good scope to the right man, with prospects of early promotion.—Applications, in writing, stating age, experience and salary required, to Employment & Welfare Manager JOHNSON & PHILLIPS Ltd., CHARLTON, LONDON, S.E.7
(K 298p)

A YOUNG ELECTRICAL ENGINEER with an interest in contracts work is required by the Marine Department of the English Electric Co., Rugby. Applicants should be of H.N.C. standard, and have had practical engineering experience. Preference will be given to those with a commercial and/or marine background.—Write, giving full details and quoting ref. 430A, to Central Personnel Services, English Electric Co. Ltd., 24/30 Gillingham Street, London S.W.1. (K 388)

ACCOUNTS CLERK required by well-known London W.1 contractors. Must have full knowledge of preparation of invoices for all types of installation contracts and able to agree final accounts with Quantity Surveyors, etc. Permanent post with good prospects for suitable applicant.—Details of experience and salary required, in confidence, to Box No. 5047, Electrical Times. (K 392)

ANGLO-IRANIAN OIL COMPANY requires one ELECTRICAL ENGINEERING DRAUGHTSMAN for work in London with visits abroad. Age, 23-30. Ordinary National Certificate in Electrical Engineering essential. Higher National Certificate desirable. Practical experience to include 5 years' apprenticeship followed by 2 years' in the drawing office of a firm engaged in the design layout of power station plant, h.v. substations, switchgear, distribution networks, and electrical installations. Applicants should write, stating age, qualifications and experience quoting Department M.1297 to Box No. 6186 at 191 Gresham House, E.C.2. (K 377)

ARMATURE WINDERS required for d.c. and a.c. work. London district; five-day week. Applicants should give full details of experience.—Box No. 5051, Electrical Times. (K 415)

ELECTRICAL DRAUGHTSMEN, one senior, one junior, required, West Midlands. Experienced low tension control gear layouts and diagrams. Senior man must have knowledge heavy plant layout. Compulsory pension scheme. Canteen facilities. State age, if married, present salary, and give references.—Box No. 4041, Electrical Times. (K 120)

ELECTRICAL ENGINEER DRAUGHTSMAN required with experience in the design and installation of power and lighting schemes, distribution and control diagrams, etc. Excellent prospects for suitable men offered by Teesside firm.—Apply, giving full particulars, quoting reference, to Box No. 5025, Electrical Times. (K 345)

ELECTRICAL ENGINEER, preferably qualified, and/or with commercial experience, required for responsible position in Pakistan. Minimum salary adequate for local conditions including social expenses and will be in accordance with qualifications and experience. Single man aged 25-35 preferred. Applicants must have sound knowledge theory and practice of power transmission and distribution. Selected applicant will receive training in factory before going abroad. Knowledge of line communication system an advantage. The post offers good prospects with an old established company.—Apply Box No. 5037, Electrical Times. (K 369)

ELECTRICAL ENGINEER required for Middle East duty by large oil company. Honours degree and/or A.M.I.E.E. with experience in h.t. and l.t. overhead and underground transmission and distribution systems; installation and operation of medium-sized Diesel power stations; industrial and domestic installations for power and lighting and operation of an electrical workshop. Age limits 30-40. Substantial salary and allowances; free furnished quarters/messing or allowances in lieu; paid home leave at two yearly intervals; initial period of separation from family.—Write, giving full details of experience and quoting No. 75, to Box No. 4074, c/o Charles Barker Sons & Limited, 31 Budge Row, London E.C.4.(K362)

ESTIMATOR required with experience in preparing tenders for all classes of a.c. and d.c. electrical rotating machinery, switchgear, etc., and familiar with standard specifications. 5-day week. Pension scheme.—Applications should state age, full details of experience, salary expected, to Personnel Manager, Lancashire Dynamo and Crypto, Trafford Park, Manchester 17. (K 361)

JUNIOR TECHNICAL SALES ASSISTANT required for quotation and order work in switchgear manufacturer's London office.—Box No. 5053,Electrical Times. (K 416)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

LADY DEMONSTRATOR required by leading manufacturers of electric cookers to undertake duty in the Midlands. Must be experienced and qualified. Good salary.—Particulars to Box No. 5035, Electrical Times. (K 353)

MALAYA. ELECTRICAL ENGINEER with mechanical experience required for tin mine in Malaya with own hydro-electric power station. Age 25-30, preferably single. Applicants should have served recognised apprenticeship, be A.M.I.E.E. or have equivalent technical training. Term three years with liberal salary, annual increments and H.C.L. allowance, also provident fund. Free passage and quarters.—Write, stating age and full details of qualifications and experience, to Box No. J.642, c/o Streets, 110 Old Broad Street, E.C.2. (K 379)

POWER TRANSFORMER ESTIMATING ENGINEER required immediately, age about 25. One holding Higher National Certificate preferred.—Apply, stating age, experience, and salary required, Box No. 5009, Electrical Times. (K 293)

PRODUCTION CONTROLLER required. Electric switchgear manufacturers. Applicants require first-class experience and ability to take full responsibility of a heavy and complicated programme.—Full particulars and details of salary to Box No. 5043, Electrical Times. (K 390)

REQUIRED. ELECTRONICS/ELECTRICAL DESIGNER, to take charge design and dev. wide range covering, electronic welding and process controls, small spot welders, rectifier units up to 50 kW. Valve and relay circuitry experience essential. Should have degree or equiv. with practical outlook. State age, experience and salary required.—Hirst Electronic Development, Ltd., Dermody Road, London S.E.13. (K 331)

SALES CORRESPONDENT wanted by electric light fittings manufacturers in North London. Some experience in the industry desirable, but not essential. Age about 25 to 30.—Write, giving details and salary expected, to Box No. 5041, Electrical Times. (K 371)

SENIOR DRAUGHTSMEN with up-to-date experience of h.t. switchgear wanted. Please state qualifications, age and salary required.—Apply: The New Switchgear Construction Co., Ltd., Wellesley Road, Sutton, Surrey. (K 221)

SENIOR LABORATORY ASSISTANT with practical experience of photometry and the design and development of electrical and mechanical equipment. Education, Higher Schools or B.Sc. Age, 27-35. Salary according to qualifications and experience. N.W. London.—Box No. 5039, Electrical Times. (K 370)

SUPERVISING AND ESTIMATING ENGINEER required for electrical contractors, must be highly experienced in quoting and running large competitive contracts, good remuneration to suitable applicant.—Watson-Norie Ltd., 21 Lovaine Place, Newcastle-upon-Tyne 1. (K 364)

SWITCHGEAR DRAUGHTSMEN FOR JOHANNESBURG. Applicants must have good practical and technical experience, particularly in diagram and schematic work. Single men preferred, age 22 to 25. Applications in writing, stating details of training, experience, age and salary expected, to Employment and Welfare Manager, Johnson and Phillips, Ltd., Victoria Works, Charlton, S.E.7. (K 336)

WANTED, ELECTRICAL ENGINEER to take charge of dyeworks electrical plant. Applicant residing locally an advantage.—Apply by letter, stating age, qualifications, and salary required, to Percy Andrew and Son, Ltd., Leen Valley Dyeworks, Bulwell, Nottingham. (K 420)

APPOINTMENTS WANTED

AN established connection with the B.E.A.'s wholesale and retail available manufacturer domestic commodities. Southern Counties. Expenses and commission basis.—Box No. 5021, Electrical Times. (K 343)

ELECTRICIAN (31), fully conversant contracting and maintenance; good references; married accommodation required.—Box No. 5045, Electrical Times. (K 391)

YOUNG SWISS ELECTRICAL ENGINEER will take any employment if possible in electro-technical branch or motor car industry, for purpose of learning English.—Box No. 5049, Electrical Times. (K 393)

OVERSEAS, BUSINESS AND RESEARCH EXPERIENCE

A QUALIFIED ELECTRICAL AND ELECTRONICS ENGINEER experienced in Research, Development and Business Overseas, is now available to take a position offering attractive salary and opportunity for advancement.

He has an excellent record of service with several major companies and will be interested to discuss various ways of fitting into your organisation.

Would you please write to **Box No. 5011**, Electrical Times, for more information. (K 304p)

WORK WANTED

S. C. H. Co.

4b STANLEY ROAD, SOUTHEND-ON-SEA

Having the organisation to produce Trade work from Blue prints to mass production competitively, are prepared to supply to Electricians for demonstration purposes

WARM o' COOL UNIT HEATERS

" *Particulars on request* (H 540p)

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed.—Edgware 8631 (4 lines). Service Electric Co. Ltd., Stanmore, Middx. (D 324)

ARMATURE SERVICE CO. LTD., Haddington Street, Hove (Tel.: 32996), electrical engineers and winding specialists. Distance no object. (F 739)

CASTINGS, Fisher Foundries Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (H 268)

OLD-ESTABLISHED manufacturers have capacity for special equipment, machining, winding, light assembly, finishing sheet metal work, etc.—Majestic Electric Co. (1937), Ltd., 15 Queensway, Enfield, Middlesex. (K 166)

WANTED

A.C./D.C. MOTORS, STARTERS, complete change-over installation, etc.—A.A. Electrical Co. Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (A 20)

ELECTRICAL STEEL OFF-CUTS OR COREPLATES required. Small and large quantities taken, approx. 0·024-in. gauge, minimum width 3 in.—Box No. 4077, Electrical Times. (K 219)

ENAMELLED COPPER WIRE 25, 26, 30, 31, 32, 34 S.W.G. BRASS ROD, ¼, 3/16, ⅜, 5/16 ⅝, ½ diam. Offers of any small quantities of these welcomed. Urgently needed.—Cox-Walkers Ltd., Feethams, Darlington. (K 341)

ENAMELLED OR RAYON/SILK COPPER WIRE required 27-30 s.w.g.—Renas Eng. Co. Ltd., 107 Albert Road, S.E.25. Tel. ADD 6055. (K 245

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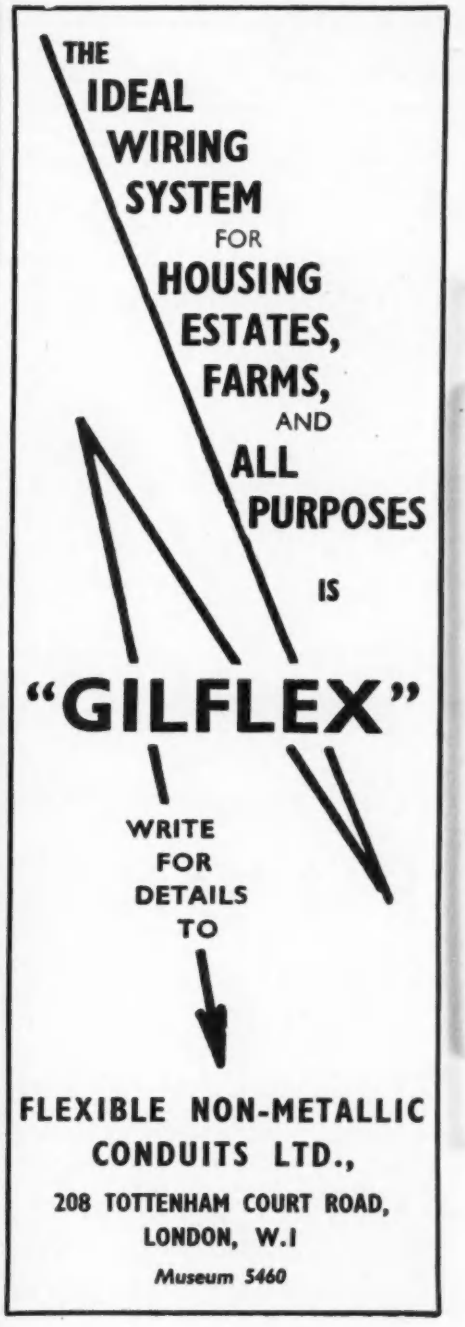

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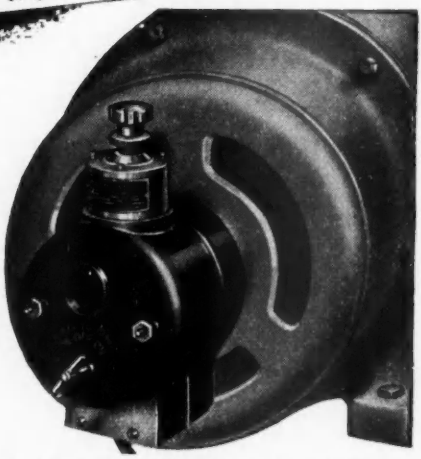

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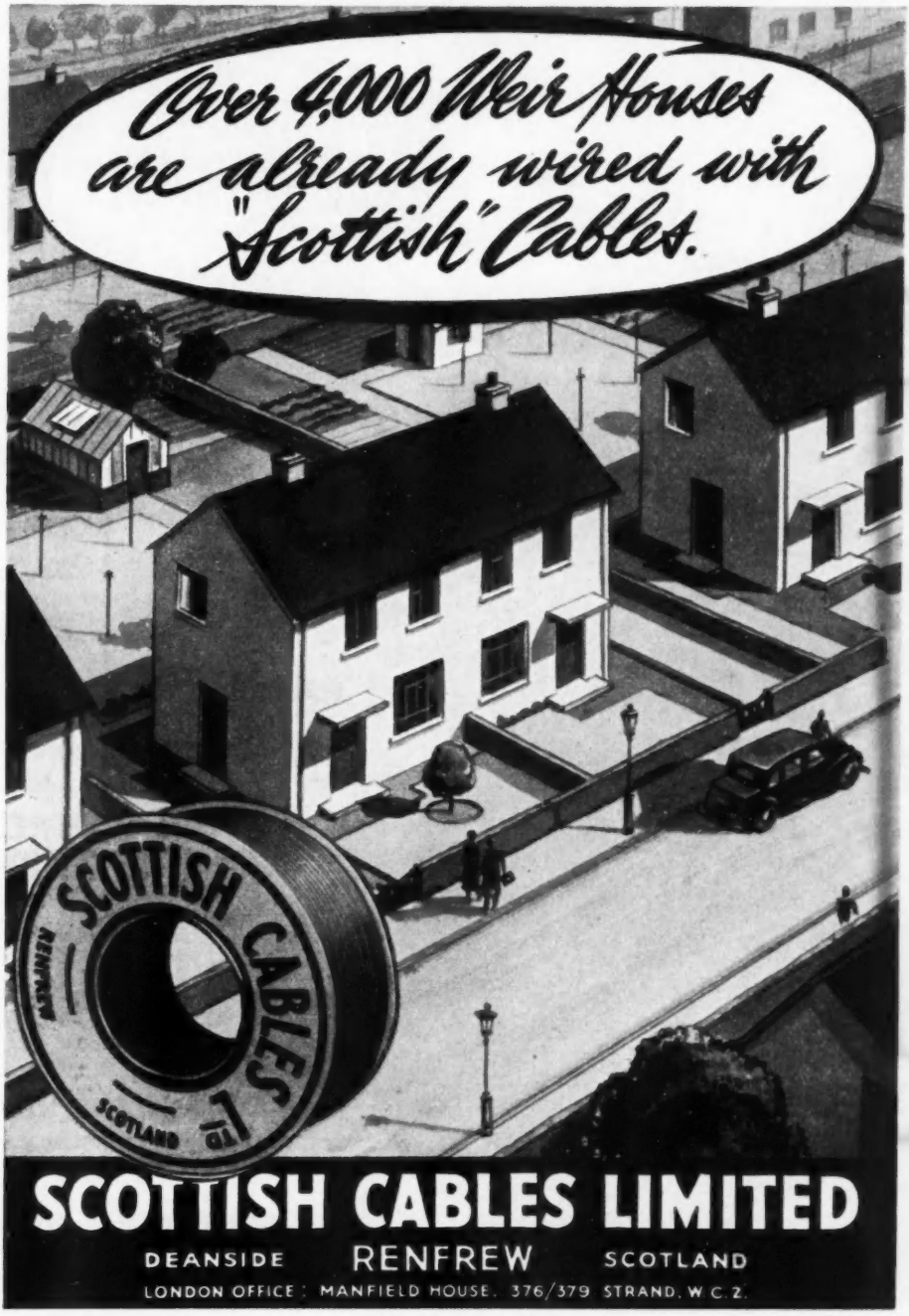
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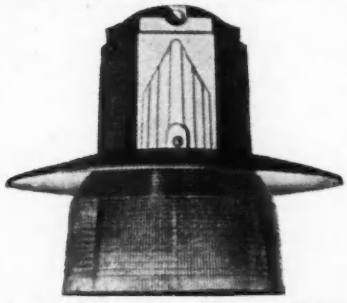

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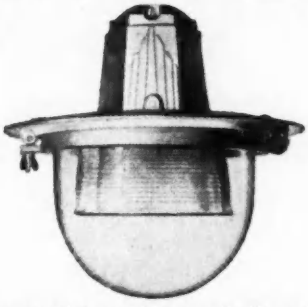

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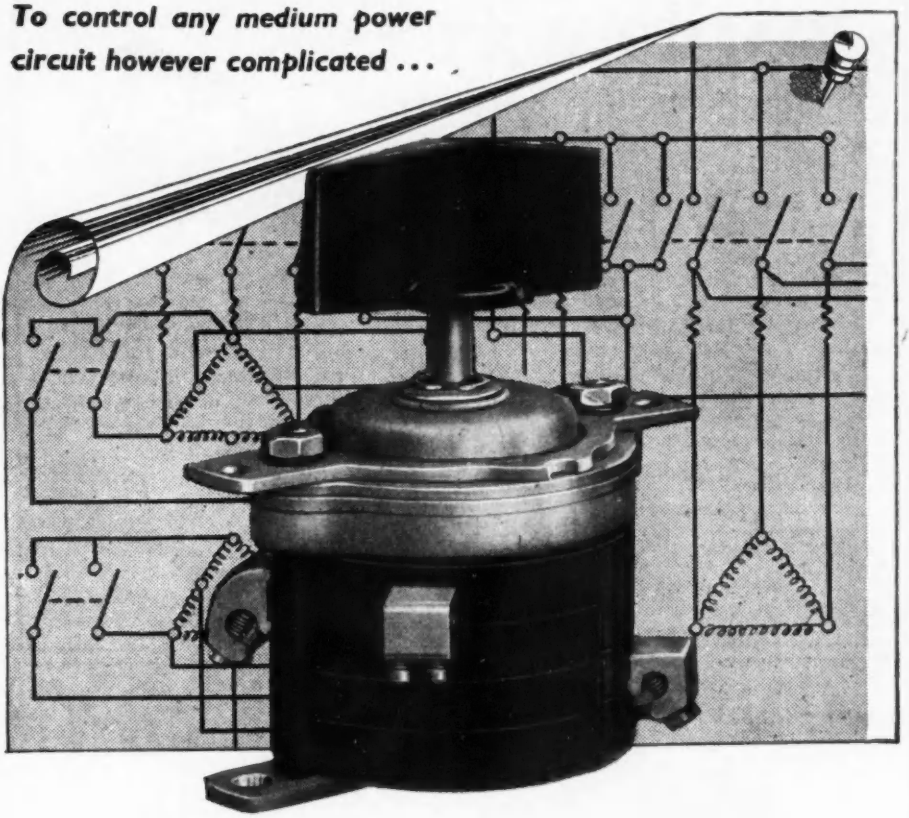

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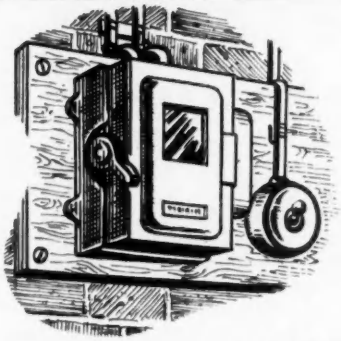

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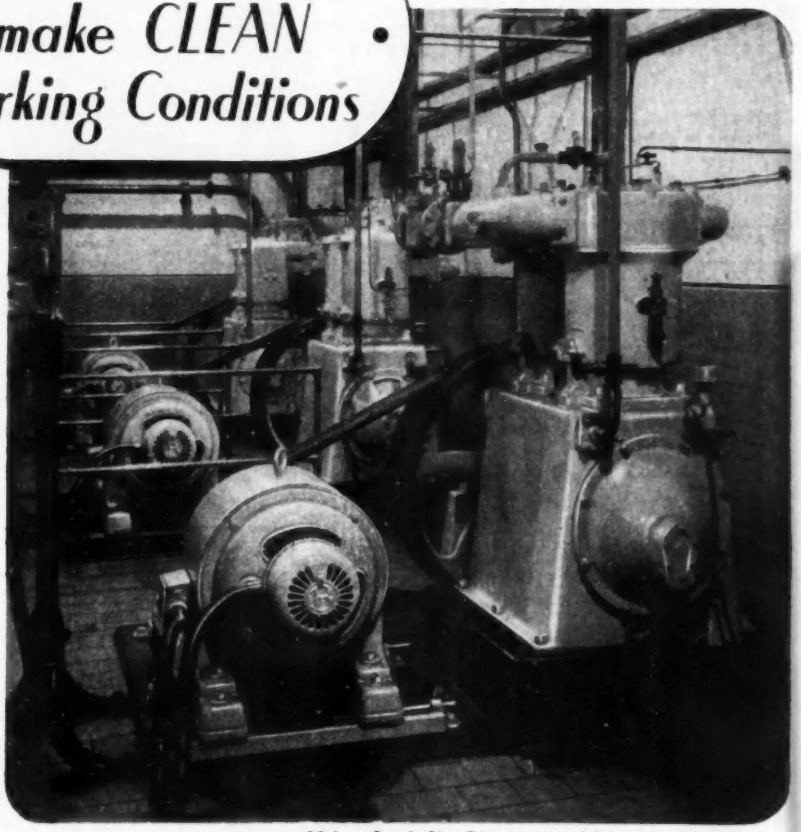

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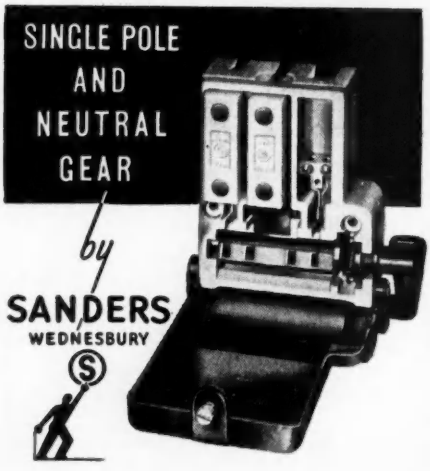

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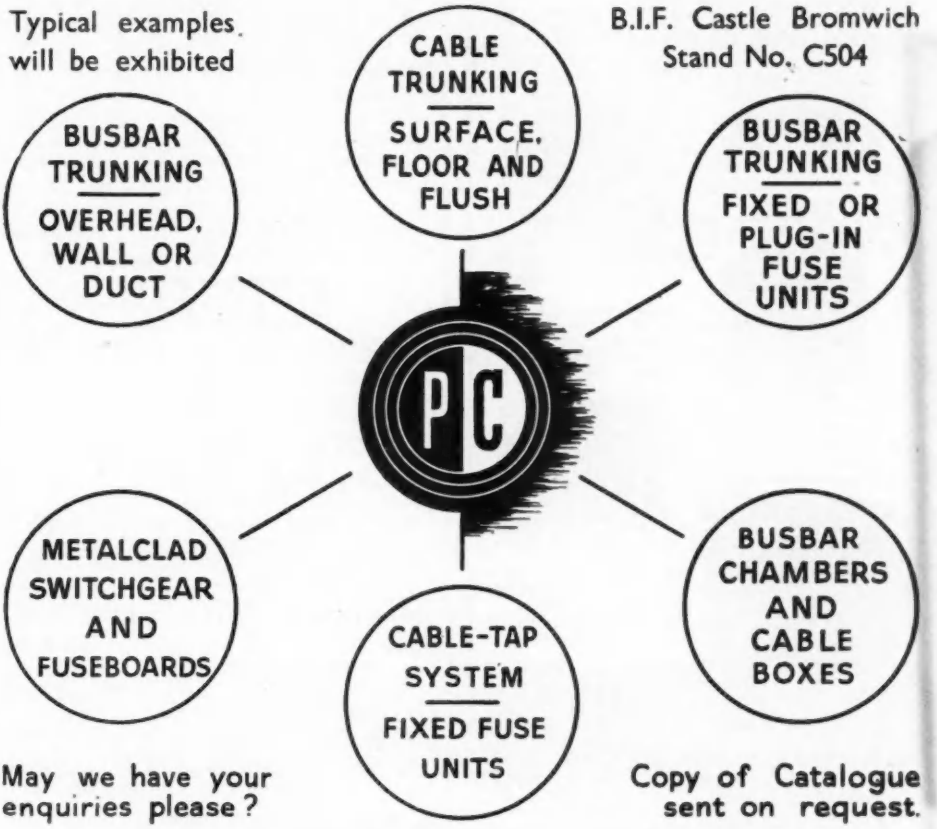

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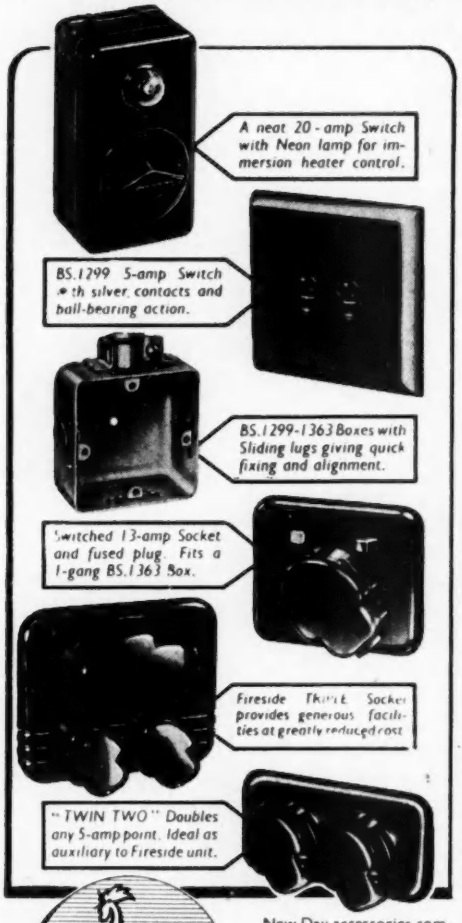
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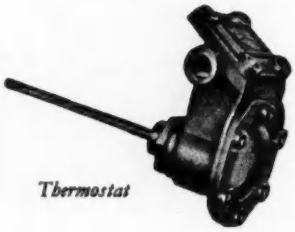

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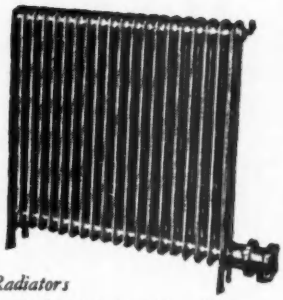

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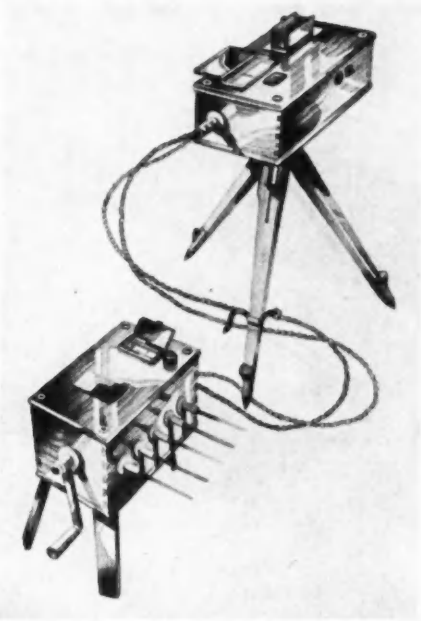

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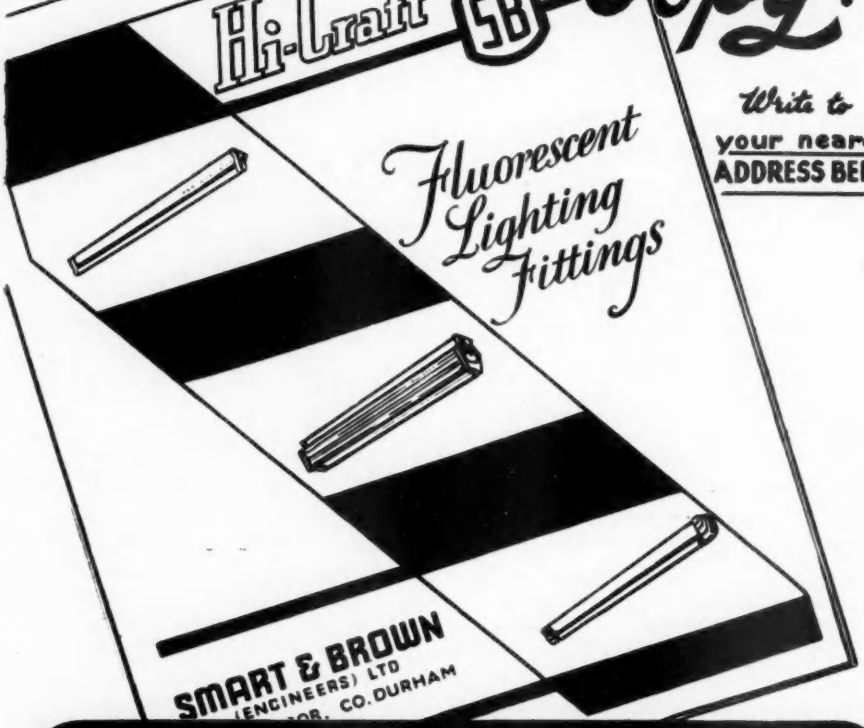

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